orbit

OISE/UT's Magazine for Schools
Four Theme Issues Per Year Devoted to Education

Vol. 32, No. 4, 2002

INSTRUCTIONAL INTELLIGENCE

Guest Editor:
Barrie Bennett

Ontario Institute
for Studies in Education
of the University of Toronto

new

www.orbitmagazine.ca

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Instructional Intelligence
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Orbit publishes four theme issues per volume on topics of concern and relevance for teachers and administrators working in schools and school systems, from junior kindergarten to the end of high school.

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Layout: Tracy Choy, BTT Communications

Printed and Bound in Canada
by BTT Communications

ORBIT SALES AND CIRCULATION
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Second Class Mail
Registration Number 4511
ISNN 0030-4433
Canadian Publications Mail Product

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Instructionally Intelligent . . .

Socially smart

Barrie Bennett

The rationale for this article, and the *Orbit* issue, stems from my experience with educators from around the world. We simply do not have a common way of thinking about instruction and how it plays out in the classroom. Jerome Bruner's comment is apt, that what we lack in education is a clearly articulated theory of instruction.

Any artist can go to an art store and purchase paints; any teacher can attend a workshop to acquire additional instructional processes. The artists can say they are cubists; the teachers can say they are constructivists. That does make those people artists or teachers. Having a repertoire and philosophy are insufficient necessities in becoming artistically or instructionally intelligent.

Effective teachers, like effective employees in all occupations, have ways of thinking about what they do and a corresponding repertoire of ways to do things. Hundreds of books on education contain hundreds of methods on how and what to teach. Yet we take for granted that teachers are instructionally skilled.

Some of you would no doubt appreciate a clear definition of instructional intelligence. I can't provide that. But I can tell you that a number of areas must be integrated in order for an educator to demonstrate instructional intelligence:

- having a rich and meaningful repertoire of ways to assess learning
- having a deep knowledge and ability to intersect multiple content areas
- having an extensive understanding of how students learn
- having an extensive repertoire of instructional methods that you can integrate in a variety of ways
- having the ability to wisely go about the process of educational change;
- having a personality that encourages students to walk into your room.

Perhaps you can list others.

THE QUESTION

What are you thinking about when you decide to give a mini-lecture or assign group work or a Venn Diagram? Perhaps you decide to use Reading Recovery or a process as simple as Think Pair Share. What leads you to these decisions?

Consider the Think Pair Share tactic which is one of the least complex of approximately 300 cooperative learning tactics. Think about all the things the teacher could or should consider if Think Pair Share is going to be applied effectively. If we employed a rubric, what would Level Four look like for the teacher who employed this process in the classroom? Before I respond to this question, I would like to illustrate why I believe instructional integration is worth considering.

DEVELOPING A PERSPECTIVE ON INSTRUCTIONAL INTEGRATION

In a playful way this article is working at illustrating the unlimited and delightful possibilities that exist in the design of powerful learning environments. I am arguing for a more integrationist position; one that realistically reflects how experienced and effective teachers create learning environments ... and create those environments in the moment as they sense, select, integrate, and respond to the endless classroom pressures and possibilities.

Effective teachers, like effective employees in all occupations, have ways of thinking about what they do and a corresponding repertoire of ways to do things.

At the simplest level, what the public asks of teachers is to demonstrate expert behaviour in the classroom—to do the best for kids. Also at the simplest level, expert behaviour is what we expect of someone who rebuilds the engine of a car or repairs a washing machine or rebuilds a hip or operates on our eyes. So, to expect expert behaviour from teachers seems reasonable. Of course when we step back and consider that teachers are spending five to six hours a day for approximately 200 days a year with approximately 25 to 30 students, it may appear to be more akin to being reasonably impossible. Teachers are not simply one-on-one with a piece of technology or with the needs or problems of one or two clients—as in banking or medicine or law.

So, what is expert behaviour? At the broadest level, expert behaviour is what one person does as the result of intense and thoughtful effort over time; about ten years of intense effort (Bereiter & Scardamalia, 1992). Paralleling that literature, the research on intelli-

INSTRUCTIONAL TACTICS

PMI—Positive, Minus, Interesting •*(A thinking organizer)*
PMI assists in making wise decisions—it is often connected to the area of critical thinking.

- Positive—Reasons why something is a good idea or decision.
- Minus—Why something won't work or is an unwise idea.
- Interesting—The position or action one takes having balanced out the Positives and Minuses.

EBS—Examine Both Sides • *(A thinking organizer)*
EBS is connected to the process of critical thinking—searching for truth. This tactic encourages students to look at the world from another's perspective, unlike a debate where students select and defend one position.

Fish Bone • *(A graphic organizer)*
Fish bone is used to organize information and is often used in problem solving or to identify and organize factors. The head of the Fish Bone provides the issue or idea that acts as the focus for the thinking, students organize ideas according to some type of classification of the main ideas and sub ideas.

Venn Diagram • *(A graphic organizer)*
Venn diagrams are used to organize information and invite the learner to ask how are things the same and how are they different. Venn diagrams do not have to overlap and can occur as one circle within another or two circles not touching.

Think Pair Share • *(A group organizer)*
Students are asked to think to themselves, then share with a partner. To be effective, students must listen to each other and ensure that not just one student does all the talking. An alternative is Think Pair Square. One person talks, the next person has to paraphrase what the person said, then that person shares, and the next person has to share what that person said, etc.

Numbered/Lettered Heads • *(A group organizer)*
Groups number off (1, 2, 3) or letter off (A, B, C). An effective way of increasing the concept of accountability and assist in initiating a transition, or in handing out and collecting materials.

Value Lines • *(A thinking/emotions organizer)*
Value Lines pushes students' analysis and evaluation levels. Even though students have only two choices, they have a wide range of values between those two extremes. Interestingly, as students explore their thinking around those feelings they often make complete reversals in their positioning.

Walk About • *(Building relationships)*
Walk About links other more complex processes. It builds individual accountability, physical movement and variety into the learning process. One student from a group joins another group and shares the home group's ideas. This student then returns with the comments and ideas gathered.

gence reports that one's IQ is not a trustworthy factor in predicting success. The better predictor is intelligent behaviour. Perkins (1995) in his book *Outsmarting IQ: The Art of Learnable Intelligence* reports that intelligence is predicated on a combination of deep knowledge within multiple domains, the ability to recognize patterns, the ability to thoughtfully access an extensive repertoire of strategies, and taking time to reflect. I see "intelligent behaviour" as synonymous with *expert behaviour*.

What might some of the components of expert teaching behaviour be? We have asked that question of teachers and read the literature for the last 25 years. It seems that what we are asking of teachers is to take the influence of their personality and to integrate their understanding of content, of instructional processes, of assessment, and their understanding of the learner—to do it collectively (within the school and within the district) and be simultaneously empathetic, caring, enthusiastic, polite, humourous, organized, fair, with-it, and assertive.

What we are after is supporting teachers on a journey to become experts. We want expert teachers who collectively demonstrate intelligent behaviour in the design of powerful learning environments. And we want all the players in this process to become key players in the design and support of that journey. They must collectively have the ability to initiate, implement, and sustain educational change.

> *Teachers are not simply one-on-one with a piece of technology or with the needs or problems of one or two clients—as in banking or medicine or law.*

Currently, too much instructional information is raining down on teachers' heads. Perhaps it is time to consider the whether; whether or not teachers can meaningfully implement everything they are being asked to implement. Below I present an organizer that attempts to make some sense of all these instructional methods.

Organizer

So how do you make sense of all the instructional possibilities? Here's a list of instructional "stuff" that you as a teacher have as resourses. How would you invite them to play out in the design of a learning environment in your classroom?

- Think Pair Share
- cooperative learning

INSTRUCTIONAL TACTICS

Gallery Tour *(A processing tactic)*
A student tapes or pins up a work completed by his/her group then stands by it and explains it to a small group of other students who visit. About 2/3 of the class are touring and 1/3 are sharing. They then rotate until each person has had a chance to share.

Inside Outside Circles *(A sharing tactic)*
Students are placed in two circles—one circle within the other, each student facing another. Students have 15 to 30 seconds to think about the question on the board, then the inside person is asked to share with the person on the outside their attempt to solve the question. Then the outside person shares or extends the thinking of the inside person. Then the outside people rotate one to the left or right, ready for the next question and interaction with a new person.

Four Corners *(An evaluation tactic)*
Begin with a statement, issue or question and students choose a corner that best captures their perspective, view or response, e.g., strongly agree, agree, strongly disagree and disagree. They move to that corner and share with the others their why they made that decision.

Three Step Interview *(Check for understanding tactic)*
Students are encouraged to share their thinking, ask questions and take notes. Each student is assigned a letter, then each is assigned a role: A=Interviewer, B=Interviewee, C=Reporter. The roles rotate after each interview.

Place Mat *(An organizing tactic)*
Groups of students work both alone and together around a single piece of paper to simultaneously involve all members. The paper is divided up into pieces based on the number of members in the group, with a central square or circle. Students record their reflections and ideas related to a key question or issue. Many variations are possible, from simply sharing with their group to each choosing their most important issue for the centre, to cutting out their section and recombining with other groups.

Graffiti *(An idea generating tactic)*
This creative brainstorming process involves collecting the wisdom of all or most of the class. Each group has a large piece of paper which has a topic (same or different) in the middle. Students get 30 seconds to think and then 60–90 seconds to individually but simultaneously record their ideas on the paper. They then stop, stand up, and go, as a group to a different piece of paper and again write their ideas. They continue until each group has visited each of the others.

Team/Games/Tournament *(Check for understanding tactic)*
TGT is usually employed as a check for understanding information that was taught or acquired. Students work in a home team of three and review the information learned. They then break into tournament groups where one student from each group gets together with two students, each from one other group. Tournament groups then respond to a number of questions that are on cards with the answers on the back. When they have completed the questions or the time is up, they return to their home team and add up the individual tournament scores. The group with the most points receives an incentive.

- brain research
- accountability
- wait time
- lecture
- responding to student responses
- mind mapping
- at-risk students
- gender issues
- success
- modeling/demonstration
- distributing responses
- concept attainment
- covert/overt
- convergent/divergent thinking
- learning disabilities research
- levels of thinking (Bloom's Taxonomy)
- checking for understanding
- three step interview
- academic controversy
- Jigsaw
- feeling safe
- brainstorming
- positive minus interesting (PMI)
- active participation
- multiple intelligence
- multiculturalism
- learning disabilities

Let's return to the question asked earlier: *"What are you thinking about when you decide to give a mini-lecture or assign group work or a Venn Diagram? Perhaps you decide to use Reading Recovery or a process as simple as Think Pair Share. What leads you to these decisions? Which items in the above list can be linked to Think Pair Share?"*

To initiate Think Pair Share, the teacher has to consider whether or not the students feel safe sharing with one another. The brain research informs us that the "brain" needs to feel safe. If it does not feel safe, then the student is not going to willingly engage in a paired discussion. You might also consider whether or not your students have the collaborative skills of "actively listening" and "paraphrasing" (cooperative learning) . . . what if they put each other down? In a parallel vein, consider whether or not they are ready to have "boys" talking to "girls" (gender) and will students talk with students who are not that popular (two other versions of safety). What if you have English as Second Language students (multiculturalism) or a student with autism or Downes Syndrome or a Learning Disability; what adaptations need to occur so that they can participate or not feel left out?

In order to get your students talking, one option you have is to frame a request or question. That implies a sensitivity to clearly framing questions or requests. What level of concern will you invoke; will they only share with each other or will some be randomly selected to share with the class? What if you simply ask them to share; how do you know they will both talk—what if one person is more talkative, the other quieter? What level of thinking (say from Bloom's or Aschner's Taxonomy) will you select in the design of the question? Will it be a convergent or divergent question (we know they serve different purposes)? Depending on the complexity of the question or the uncertainty of the question you must decide how much wait time to provide. We know that wait time increases success by allowing students to work in their heads first (covert thinking) before sharing their thinking (overt action).

Once they have shared, they are obviously going to do something—or else why invoke Think Pair Share? You must have had an objective or outcome. If not, why did you select it? Now, in deciding to randomly call on several students to respond, you must consider that you are asking students to succeed or fail publicly. How will you respond to their response? What if they give you a correct, incorrect, partially correct response, or a silly response, a guess, a convoluted response or even a no response? Should you suspend judgement or judge their responses? What effect will it have if you select one of those two judgement options? How will you make sure they save face?

Last, consider how you can integrate Think Pair Share with more complex instructional processes. What if you attempt to employ Jigsaw and the students cannot do Think Pair Share; even though Jigsaw demands they be skilled at Think Pair Share? What if you are involving students in Taba's Inductive Thinking strategy, Bruner's Concept Attainment Strategy, or the Johnsons' Academic Controversy. How can you actively involve all students in sharing their thinking and hypotheses if you do not activate something similar to Think Pair Share?

We have seen Think Pair Share fail on a number of occasions; and for good reason—it's easy to understand its structure, it's difficult to implement the process.

What follows is an attempt to explain the elegance that belies instructional simplicity—a way to group all the instruction "stuff" presented above. The groups have been created using "Hilda Taba's Inductive thinking strategy" and labelled according to the literature or instruction.

CHART 1. Conceptual Framework for an Instructional Repertoire

Pedagogy

1. Structure: The instructional concepts, skills, tactics, strategies, and organizers that a teacher can apply to affect learning.
2. Purpose: To increase the chances we more effectively meet the needs of the learner.
3. Examples: Interest (concept), Wait Time (skill), Think Pair Share (tactic), Mind Mapping (strategy), and Multiple Intelligences (organizer)
4. Argument: Pedagogical ideas and practices represent one of the critical distinguishing attributes of a teacher—pedagogy assists in constructing a meaningful learning environment.

Instructional Organizers

1. Structure: Frameworks that organize an array of instructional ideas and practices into an interrelated yet open-ended pedagogical set.
2. Purpose: They act as lenses that clarify or enhance communication and thought about instruction.
3. Examples: Multiple Intelligences, Learning Styles, Bloom's Taxonomy, Children at Risk, Learning Disabilities
4. Argument: They assist teachers in making decisions about the teaching and learning process through the needs and inclinations of the learner(s).

Instructional Concepts/qualities

1. Structure: Qualities of effective teaching and learning which teachers seek to enact through the application of a variety of instructional skills, tactics, strategies and organizers.
2. Purpose: Provide lenses to understand how, when, and where to apply one's instructional repertoire
3. Examples: check for understanding, humour, enthusiasm, accountability, relevance, caring, authenticity, novelty, meaningful
4. Argument: They increase the chances that a teacher more effectively selects and integrates those instructional processes that make a difference in student learning.

Instructional Strategies

1. Structure: These instructional practices involve a sequence of steps or a number of related concepts. They often have generic applicability across grade levels and subject areas.
2. Purpose: They have specific although varying effects on student learning. They can affect logical thinking; social thinking and action; memory; creative thinking, etc.
3. Examples: Cooperative Learning (Johnsons' approach: 5 factors and a process; Thelan's Group Investigation: 6 steps)—social theory; Mind Mapping (5 factors and a process—information processing and memory; Concept Attainment (3 steps)—information processing.
4. Argument: Their use is usually supported by research and theory. They engage students in powerful learning processes and provide alternatives in meeting the diverse learner needs. Compared to skills and tactics, strategies provide the largest effects on student learning. Note that they depend on skills and tactics for effective implementation.

AN IDEA FOR INSTRUCTIONAL DESIGN

David Perkins (1986) in his book *Knowledge as Design* argues that our thinking and actions are often limited because we lack understanding of the concepts that guide our thinking and actions. He contrasts having "knowledge as information" with "knowledge as design."

In our work over the last 15 years (Rolheiser, 1986; Bennett, Rolheiser, & Stephan, 1992; Rolheiser, 1997; Bennett, Anderson, & Evans 1997)we have employed Perkins' four questions to facilitate understanding:

1. What is the **structure** of the concept?
2. What are the **purposes** of the concept?
3. What are the **model cases** of the concept?
4. What are the **arguments supporting** or not supporting it?

For example, if the concept were screwdriver we would respond with:

1. **Structure:** a handle, a shaft and a shape on the end that fits into screws
2. **Purpose:** it assists us in putting screws into objects
3. **Model Cases:** Flat Head, Robertson and Phillips
4. **Argument:** It gives us mechanical advantage

We apply these four questions to clarify the concepts of Pedagogy, Instructional Organizers, Instructional Strategies, Instructional Tactics, Instructional Skills, Instructional Concepts, Integration and Stacking Instructional Processes, and Instructional Power. Obviously, Monet did not paint with one colour. Nor do master chefs limit themselves to one salad. Hair stylists, dentists, contractors all have an extensive repertoire of responses to respond to different situations. What is your repertoire, how do you integrate it, and how powerful is it in meeting the diverse needs of the learners?

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Instructional Tactics

1. Structure: An action usually invoked by the teacher that helps achieve a specific purpose, usually without a series of steps or phases. If steps or phases are present, they are less complex than those found in Strategies. Tactics cut across most subjects and grade levels, and may be linked to other instructional tactics and skills in the enactment of a broader strategy.
2. Purpose: To involve the student in an activity that has a particular purpose
3. Examples: de Bono's CoRT program (e.g., EBS—Examine Both Sides of an Argument; PMI—Plus, Minus, Interesting); Kagan's simpler cooperative learning structures (e.g., Think Pair Share, and Inside Outside Circles).
4. Argument: They are often employed to enrich the application of strategies.

Power

1. Structure: A statement (usually a number) that communicates the worthiness of something.
2. Purpose: It informs us of the effects we can expect to get as compared to other approaches.
3. Examples: how fast (time); how much (frequency or percent); what is remembered (total score); usually refers to an effect size statistic. Effect size represents how far you can move the mean score of one group (experimental group) away from another (the control group).
4. Arguments: The size of the effect assists us in making decisions related to what we decide to employ in the classroom, as well as, what we decide to learn as teachers as part of our professional development.

Instructional Skills

1. Structure: Specific and relatively simple instructional actions of teachers that enhance learning.
2. Purpose: They assist the teacher to mediate the gap between the learner and the learning and increase the chances that the more complex instructional processes are effectively implemented.
3. Examples: Framing questions at different levels of complexity, providing time to think after asking a questions, linking to the learners past experiences, checking to see if students understand and providing a visual representation (e.g., a model of the human heart).
4. Argument: Without them, we would find it difficult to engage some/all learners in learning. Without the skills, the power of the tactics and strategies is drastically reduced.

Integrating Pedagogy

1. Structure: The interconnected use of instructional organizers, concepts, skills, tactics, and strategies.
2. Purpose: To engage students in a variety of approaches to learning to achieve multiple effects.
3. Examples: The teacher starts by asking students to work with a partner to go through a Concept Attainment strategy to identify the essence of 'simile.' Next the teacher asks students to work alone to classify all the NO examples and testers into groups that represent other figures of speech. They then form cooperative groups of four, compare their classifications, and then the compare their thoughts with those of the teacher during a mini-lecture. Finally, the students work alone in small groups to complete a mind map on writing techniques.
4. Argument: To more effectively meet the diverse needs and abilities of learners.

Understanding Brain-based Research

Cognitive psychology, neurobiology and education

Roy Greenwood

The recent findings from neurology and cognitive psychology may revolutionize the way educators carry out their jobs but it may be too early to be jumping in with both feet. We must test the waters and work with the neurobiologists and cognitive psychologists to see what they are finding and how it might apply to our classroom.

> *We must work with the neurobiologists and cognitive psychologists to see what they are finding and how it might apply to our classrooms.*

DIFFERENT APPROACHES TO THE BRAIN

Howard Gardner's writing on Multiple Intelligences, for example, is work done in the realm of cognitive psychology. Cognitive psychology is research based primarily on observation of behaviours and theories developed to explain these behaviours. This is research where the brain exists as a "black box." The researcher is trying to explain what is happening by changing situations external to the brain and observing the resultant behaviour. From these behavioural observations the researcher tries to explain what is going on in the "black box." Presently, little if any, research from neurobiology exists that either supports or refutes Gardner's work. To say it is research based on findings from "brain" research may be misleading. This does not negate the importance of these findings but underlines the need for testing these ideas in the classroom, such as the study done by Karen Goodnough (in this issue). It is by doing this type of action research that we can add further evidence to the theory and how it applies to our classrooms.

Neurobiologists, however, with recent advances in technology can now look into this "black box" and see which parts of the brain are working when the individual performs various tasks such as reading. This perspective is something that previously had to be done through post mortem studies of individuals. Knowing the regions of the brain that are involved in various brain functions helps the neurologist when working with an individual who has suffered some sort of brain trauma but as yet the application to education may be limited (see page 8 of this *Orbit* issue).

Just because it is known that a certain part of the brain is used in language production (Brocca's area) doesn't help the classroom teacher teach English. However, knowing that this part of the brain is less malleable after a certain age may be important to the classroom teacher or curriculum developer.

Dr. Chugani, an American pediatric neurologist, has completed studies using imaging technologies on infants and young children to show which part of the brains become active and when. Others have used this and other data to compare it with Piaget's stages of development. Neurobiology research has shown some correlation between Piaget's stages and brain development.

BRAIN RESEARCH TELLS US ...

- The brain's goal is survival.
- Emotion is powerfully connected to thinking.
- The brain needs to make connections.
- The brain is hard-wired for "experience expected" situations.
- The brain is "holistic." Although some areas have specific responsibilities, the areas are interdependent.
- The brain remembers what is important.
- Intelligence is mediated/enhanced by social situations.
- The brain uses 25% of available metabolic energy at rest, it needs oxygen on demand—those who exercise increase the blood supply to the brain.
- Brains that live in enriched environments have 40% more neuron connections than brains that live in bland environments.
- Dull, boring environments cause the loss of dendritic connection. These environments are more damaging than enriched environments are at enhancing brain development.

Another neurologist, Dr. M. Diamond, in her work on "enriched environments" showed that rats raised in enriched environments developed more dendrites than those kept in regular cages. This work has been applied to the development of children in programs like Head Start which provide an enriched environment for students. The assumption is that more dendrites mean smarter individuals. This is not necessarily true in that there are disorders where the individual has more than the normal number of dendrites and these individuals typically function below a normal functional level.

NO CONSENSUS ON INTELLIGENCE

There is obviously something else going on that we have not yet discovered. Neurobiologists do not yet know what intelligence looks like in the brain, whether it is more dendrites, larger parts of the brain, or other possibilities, and as the work of Gardner and others illustrates, cognitive psychologists are all not in agreement as to what intelligence is either.

In a study of my own, I tried to look at the two fields and see if there is a correlation. The study examined learning styles (a cognitive concept) and, what part of the brain the subjects used (neurobiology), when they were exposed to either visual input or auditory input. The students had previously completed a learning styles inventory to determine their learning style. The students were then placed in a Magnoencephlagraph (MEG), a new fancy version of an electroencephalograph (EEG), to see what part of the brain was actually being used in learning activities.

The results showed little or no correlation between the written test of learning styles and the part of the brain where one would expect to see activity. This information can be interpreted in a number of ways: the learning styles inventory is flawed, the MEG is flawed, or the concept of learning styles is not correct.

Continued research in neurobiology and cognitive psychology will support the findings from each other's field; cognitive theories are being tested by the neurobiologists and findings from neurobiology are being incorporated into new cognitive theories. There is now and will be more in the future, opportunities and responsibilities for educators to also participate in this research.

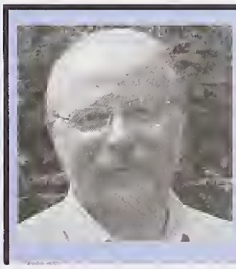
A NEED FOR CAUTION

Educators have much to gain by moving beyond the borders of our traditional research. As our body of knowledge increases through improved research techniques and the development of technology, we must accept that we can no longer be experts in all areas. We need to be aware of findings from other disciplines and consider how these findings impact upon our practice. If we keep our minds open to the findings from other disciplines, like cognitive psychology and neuorobiology, we will have a greater understanding of what we do and be able to make better decisions about what, when and how curriculum should be taught.

It has been suggested (Byrnes & Fox, 1998, p. 328) that developmental psychologists, educational psychologists and teachers fall into one of four orientations with respect to neuroscientific research:

1. those who readily accept (and sometimes over-interpret) the results of neuroscientific studies
2. those who completely reject the neuroscientific approach and consider the results of neuroscientific studies to be meaningless
3. those who are unfamiliar with and indifferent toward, neuroscientific research
4. those who cautiously accept neuroscientific findings as being a proactive part of the total pattern of findings that have emerged from a variety of research methods in cognitive science.

Our educational practices or "instructional intelligence" can be strengthened and improved through understanding and critical reading about the brain from the areas of cognitive psychology and neurobiology. This new understanding will give us yet another lens to help understand how students learn.



Roy Greenwood is presently a Vice Principal with the Peel District School Board. He is completing his doctoral degree at OISE/UT investigating the implications of neurological research on education.

EDUCATIONAL IMPLICATIONS OF EMOTIONS

Educational Implications

We have more neurons from the emotional part of the brain connecting to the cerebral cortex than the reverse. The implication is that the emotions are capable of highjacking the cortex in less than a moment's notice. Understanding emotions is critical to development and learning.

Emotional Development

- Recognizing emotions–self awareness
- Managing moods–self control
- Motivation
- Empathy
- Social skills

Emotional intelligence relates to motivation and stress. A student who repeatedly fails has become negatively conditioned to the learning process, the teacher and the room or school. Then there are children whose stress level is high before they enter the classroom:

Risk Factors

- Physical abuse
- Sexual abuse
- Emotional abuse
- Neglect
- Drugs and Alcohol
- Witnessing violence
- Living in poverty, single parent, on welfare, in subsidized housing
- Divorce *(and at times multiple divorce)*
- Gender *(any situation where a person is dehumanized, marginalized, not encouraged to think, to dialogue or to feel safe).*

In terms of learning, stressful life events can alter the hippocampus *(an organ in the brain that is necessary for long-term memory)*. With severe trauma, shrivelling of the dendrites occurs; with repeated stress *(e.g., victims of repeated child abuse)* that damage to the hippocampus can become permanent.

Our Brain's 20 year Developmental Trajectory

Connecting biology to pedagogy

Robert Sylwester

Most animals are born with a substantially developed brain, replete with innate capabilities for recognizing and responding to environmental challenges. A weaned feral cat can thus survive independently in its environment.

Our human upright stance and consequent relatively narrow female birth canal led to a very immaturebirth brain, one-third its adult size. Our long dependent juvenile maturation shaped us into a cooperative social species with a rich language-driven culture.

Social skills necessary for collaborative activity are thus developmentally important—and in our complex democratic society, it's especially important that immature children learn how to collaborate effectively with those who aren't kin, and who don't even share the values and traditions that are important to one's supportive family. Parental and educational challenges abound.

A sheltered juvenile who doesn't have to depend on innate responses to survive can use play/pretend behaviours in many non-threatening settings to gradually develop and practice a variety of strategies for responding to juvenile correlates of complex adult challenges. The principal task of children and adolescents is thus to play—but also to master important explicitly taught cultural knowledge and skills that might not emerge through informal play. Our brain is beautifully organized to do this.

BRAIN ORGANIZATION

Our brain is actually a sort of consortium of many neuronal systems that individually carry out specific tasks (such as to recognize specific tones or bend a finger), and collectively integrate bits of sensory information or the elements of a task (recognize a friend, clean the house). These brain systems are functionally organized from bottom-to-top, back-to-front, and right-to-left:

Bottom-to-Top

The processing systems at the (subcortical) base of our brain unconsciously regulate such survival functions as respiration and circulation, and those within the large overlying deeply folded cortex process conscious learned behaviours.

Back-to-Front

The processing systems in the cortex recognize and respond to complex challenges. The posterior (occipital, temporal, parietal) lobes process sensory information and integrate it into a perceptual model of the current danger/opportunity. The frontal lobes then use this model to make decisions and responses. Our relatively large, cognitively-powerful frontal lobes allow us to move from the purely reactive behaviour of most animals to being principally proactive (anticipating and preparing for what might occur).

> *The principal task of children and adolescents is thus to play—but also to master important explicitly taught cultural knowledge and skills that might not emerge through informal play. Our brain is beautifully organized to do this.*

Right-to-Left

Goldberg (2001) has discovered that the right hemisphere processing systems (in most human brains) are organized to creatively recognize and respond to novel challenges and the left hemisphere systems to efficiently process familiar challenges and established response routines. For example, we may creatively use body language and shouts to get the attention of a friend in a crowd, but we'll then use the established routines of language in the conversation that follows.

We're born with a basic, survival-level version of most of these brain systems, and they function at that level with limited instruction and effort. Explicit instruction and extended practice mature such systems so that they can respond to more complex culturally driven challenges. A normal human ability range exists that limits response beyond this range to virtuosos and savants—and to the technologies that we develop to extend performance of the function beyond our biological capabilities. So, for example, the ability to walk is innate, easily mastered; but running on a relay track team involves movement skills that must be taught; and moving at 60 km an hour requires the assistance of wheels.

Our brain's 20-year developmental period thus allows it to respond reasonably well to many complex environmental challenges that evolutionary processes couldn't possibly program into our brain.

BRAIN DEVELOPMENT

We can divide our 20 year developmental trajectory into two periods of approximately 10 years. The developmental period from birth to about age 10 focuses on learning how to be a human being—learning to move, to communicate, and to master basic social skills. The developmental period from about 10 to 20 focuses on learning how to be a productive reproductive human being—planning for a vocation, and exploring emotional commitment and sexuality.

Beginnings

The first four years of each of these two decade-long developmental periods are characterized by slow awkward beginnings prior to a normal move towards confidence and competence. For example, crawling leads to toddling leads to walking leads to running and leaping.

We tend to be far more indulgent of the inevitable developmental awkwardness and errors of young children than of related early adolescent awkwardness and errors. Demanding adults tend to forget that the mastery of something as complex as reflective thought or one's sexuality didn't occur instantly and without error in their life, and it likewise probably won't in their adolescent's life.

The 10–14 year (middle school) period is especially significant developmentally. We go through seven major biological changes in our lifetime, and three of them begin or occur between 10 and 14. The seven changes are birth, death, the mid-to-late-life waning of our reproductive and cognitive capabilities, and the three early adolescent shifts:

1. from childhood to puberty (the onset of our reproductive capabilities)
2. from concrete to formal operations (the maturation of intelligence)
3. from an authoritarian to a consensus morality (the maturation of our personal and social identities).

The timely maturation of our brain's frontal lobes is central to the success of all three shifts.

A developing brain that can't carry out a function will accept adult help. But once the relevant system begins to mature, children don't want the help, even with their typically low competence level. An infant thus doesn't complain about being carried, but a two-year-old generally will. Similarly, pre-adolescents allow adults to make many frontal lobe decisions for them (what to wear, when to sleep, what to study), but they increasingly resent

ACADEMIC CONTROVERSY

This process is similar to debating. Students apply the social, communication, and critical thinking skills necessary to argue or present their case.

1. Identify the controversy
2. Groups of 4 or 6 – letter off AA(A) and BB(B), assign Pro/Con positions
3. Time to plan
4. Time for each group to share
5. Plan the rebuttal
6. Present the rebuttal
7. Flip and repeat steps 3 to 6
8. End with a Round Robin.

TEAM ANALYSIS

Through the integration of social theory and critical thinking students can think more deeply and responsibly.

- ***Phase One***

Pre-reading and reflection on the issue

- ***Phase Two***

The presentations on the issue

- ***Phase Three***

The response to the presentation

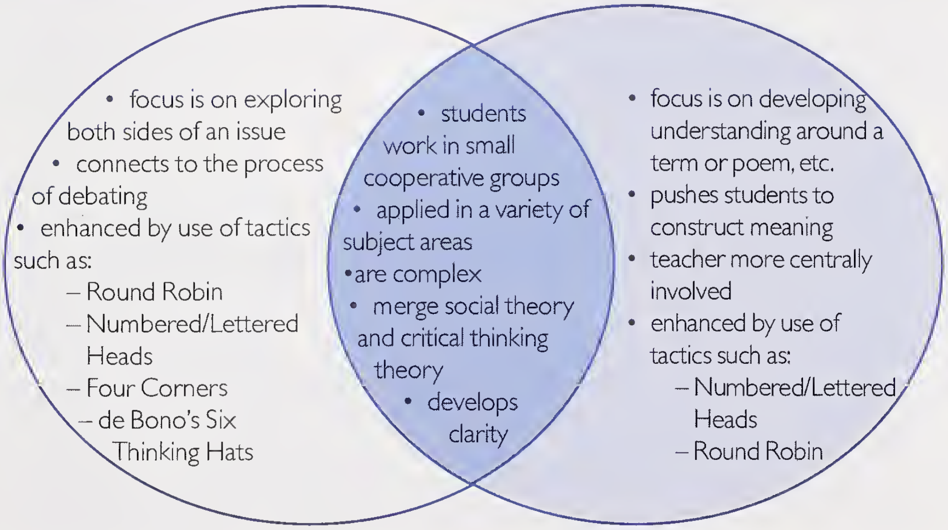
- ***Phase Four***

The teacher's response

- ***Phase Five***

Responses by the other teams.

VENN DIAGRAM COMPARING ACADEMIC CONTROVERSY WITH TEAM ANALYSIS


• focus is on exploring both sides of an issue
• connects to the process of debating
• enhanced by use of tactics such as:
– Round Robin
– Numbered/Lettered Heads
– Four Corners
– de Bono's Six Thinking Hats
• students work in small cooperative groups
• applied in a variety of subject areas
• are complex
• merge social theory and critical thinking theory
• develops clarity
• focus is on developing understanding around a term or poem, etc.
• pushes students to construct meaning
• teacher more centrally involved
• enhanced by use of tactics such as:
– Numbered/Lettered Heads
– Round Robin

> *The only way the frontal lobe decision-making processes in adolescents can mature is for them to make reflective decisions, even if their decisions are occasionally inappropriate.*

> *The common impulsive instant-gratification responses of childhood and early adolescence become less impulsive as a maturing adolescent learns to explore options and social implications prior to making a response.*

such adult direction as their own frontal lobes and personal identity mature.

They have a point. The only way children can learn to walk is to walk, even if they occasionally stumble. The only way the frontal lobe decision-making processes in adolescents can mature is for them to make reflective decisions, even if their decisions are occasionally inappropriate.

Maturation

Competence during the first 10 years of life is characterized by a move towards rapid automatic responses to challenges. For example, slow laborious initial reading tends to become reasonably automatic by age 10.

Language includes the automatic mastery of a verbal taxonomy of generally accepted object, action, quality, and relationship categories. Similarly, morality and ethics include the automatic mastery of a social taxonomy of culturally acceptable behaviors.

Competence during the second 10 years, however, is often appropriately characterized by delayed and reflective responses processed principally in the frontal lobes. The common impulsive instant-gratification responses of childhood and early adolescence become less impulsive as a maturing adolescent learns to explore options and social implications prior to making a response.

Let's place this emerging competence into its biological context. We have two separate solution/ response systems:

1. *Challenges with a sense of immediacy are rapidly and reflexively processed by our brain's innate stress-driven, conceptual (principally sub-cortical) problem-solving system.*

This system responds quickly on the basis of a small amount of emotionally intense information. It's thus quite vulnerable to making racist/sexist/elitist responses that focus on only a few highly visible emotion-charged elements.

2. *Challenges without a sense of immediacy are processed more slowly and reflectively by our brain's curiosity-driven, analytical (principally cortical) problem-solving system.*

We thus will respond *reflexively* to a car moving swiftly towards us (concerned only with its looming rapid approach), but we'll generally respond *reflectively* to a car on a lot, if we're considering its purchase (and are thus concerned with its service history, possible malfunctioning systems, cost, etc).

Our rapid reflexive system is the innate default system because it responds to dangers and opportunities that require an immediate decisive (fight/flight) response that will enhance survival. When it isn't immediately obvious whether a reflexive or reflective response is the more appropriate, both systems simultaneously search for a solution, with the reflexive system typically responding first.

Most of us thus go through life with a long string of regrets and apologies because of the late arrival of our brain's (often better) reflective response. Since many problems humans now face don't require an impulsively reflexive response, the educational challenge is to help students develop and use their developing frontal lobe reflective capabilities in a low-threat environment that enhances the shift in orientation from immature/reflexive to mature/reflective decisions, and that helps them to decide whether a reflexive or reflective response is more appropriate to the current challenge.

EDUCATIONAL IMPLICATIONS

Our extended developmental trajectory poses many challenges for educators. I believe that three especially need an increased emphasis in schools: social development, the role of play and the arts/humanities, and middle school maturation.

Social development

We're a social species in a democratic society, but we individually educate and evaluate our young in a frequently non-democratic social environment. Social and democratic skills aren't innate. How can we expect young adults to act as responsible citizens if they've not had many opportunities during their formative years to practice democratic decision-making? I've argued (Sylwester, 2000) that schools can become a marvelous developmental laborato-

Create powerful learning environments through:

Instructional Concepts
- active participation
- motivation
- levels of thinking

Related Instructional Skills
- wait time
- framing questions
- responding to student responses

> *The only way the frontal lobe decision-making processes in adolescents can mature is for them to make reflective decisions, even if their decisions are occasionally inappropriate.*

ry for students to explore various social settings/issues and to learn how to resolve social problems with non-kin. This will require two shifts:

1. *from an authoritarian administrative model of classroom management to a collaborative curricular model that involves students in many classroom decisions, and*
2. *from a focus on learning tasks that are executed by individual students to a much greater emphasis on collaborative learning and assessment. Both shifts are long overdue.*

Play and the Arts

Our brain's integrative capabilities are its greatest strength and source of enjoyment. When confronted by a unique challenge, we're generally able to draw on related prior experiences and our current analysis of the problem to create a credible solution. We enjoy games and the arts/humanities because they playfully combine a few familiar elements into an infinite number of integrative possibilities. Art has been called a celebration of the ordinary.

To expand on Goldberg's beliefs about hemispheric specialization (2001), our right hemisphere systems are organized to rapidly combine perceptual/memory functions into a creative solution to a novel challenge. If the solution is successful, and the challenge reoccurs frequently, our more linear left hemisphere systems develop a programmed established routine that we subsequently use. The route to an efficient established routine is thus through an often creative initial solution to (what was then) a novel challenge. The arts/humanities/play all enhance the development of this key creative capability.

Actually, most human learning occurs during such playful exploration. It's only in school where we call learning work, and focus on providing students with answers to questions they haven't asked. We thus need to shift from the current belief that play is educationally suspect, and that arts and humanities programs should be dropped because they're labour-intensive and difficult to precisely assess.

Middle School Maturation

We accept the early slow/awkward development of children between birth and 4, realizing that they will typically master key childhood tasks by the time they reach 10. Middle school students are similarly going through the slow awkward beginnings of the frontal lobe maturation of key adult capabilities. Shouldn't we create a 10–14 equivalent of birth–4, and allow the initial early adolescent maturation of frontal lobes to develop naturally, without the pressure of stringent educational standards and assessment? We could then perhaps think of middle school as a *recess* period during the K–12 years. It's not a do-nothing period, just as birth–4 isn't a do-nothing period (nor is school recess a do-nothing period). Birth–4 and 10–14 are two important inner-directed four-year periods, and middle school education should enhance that development.

These are three simple and biologically sound educational challenges—but a simple challenge isn't necessarily easy to resolve. These challenges go contrary to powerful 20th century educational beliefs about educational practice. Why should that concern us? We're now in the 21st century, an era when biological discoveries will become increasingly integrated into our cultural beliefs and life. It's time for educators to start thinking out of the 20th century box.

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ANNOUNCEMENT
JUST PUBLISHED

A Biological Brain in a Cultural Classroom
by Robert Sylwester

(Thousand Oaks, CA: Corwin Press)

Multiple Intelligences Theory:

A Lens for Guiding Professional Practice

Karen Goodnough

In his seminal book, *Frames of Mind: The Theory of Multiple Intelligences*, Howard Gardner (1983) proposed his theory of multiple intelligences (MI theory), a pluralistic conception of intelligence that posits the existence of seven distinct intelligences (refer to Table 1 for a brief synopsis of each). Recently, Gardner added an eighth intelligence to the list—the naturalist intelligence. According to Gardner (1999), each person possesses all of the intelligences, although everyone has a unique cognitive profile. Some intelligences may be stronger than others and be enhanced and developed over time with new experiences and opportunities for learning. The intelligences work together in complex ways and each intelligence has several dimensions.

Gardner (1999) conceptualizes an intelligence as a "bio-psychological potential to process information that can be activated in a cultural setting to solve problems and create products that are of value in a culture" (p. 34). If we extend this conceptualization of an intelligence to teachers and the complex world of teaching, it might be argued that teachers have a well-developed ninth intelligence ... *instructional intelligence.*

In my notion of instructional intelligence, teachers engage in problem-solving about their practice, striving to structure teaching and learning episodes that will foster effective student learning. Teachers have a broad range of knowledge that informs their practice—knowledge about subject matter, curriculum, instruction, their strengths and weaknesses as teachers, how students learn, and the milieu of schooling (Elbaz, 1981). Teachers are constantly looking for perspectives that will guide their reflection, decisions, and practice. MI theory provides a perspective for teachers to explore their beliefs about teaching and learning and to examine their instructional practice and how it impacts students' learning.

> *If we extend this conceptualization of an intelligence to teachers and the complex world of teaching, it might be argued that teachers have a well-developed ninth intelligence ... instructional intelligence.*

In this article, I share the experiences of a collaborative group (four teachers and me) as we explored MI theory in the context of science education and applied it to classroom practice. The theory was used as a lens to examine teaching styles, to explore beliefs about science teaching and learning, and to make changes based on those beliefs.

THE COLLABORATIVE INQUIRY GROUP

Celia (elementary teacher) was in her eighth year of teaching, having taught all grade levels from junior kindergarten to Grade 5, although this was her first year teaching Grade 5. She had experience teaching in multi-grade settings and had taught music for several years at a music school.

Ingrid (elementary teacher), was in her sixth year of teaching, but it was her first time teaching Grade 5. Both Celia and Ingrid had very little training or experience in the teaching of science.

Dave (high school teacher) had eight years of teaching experience, having spent the last two years teaching Grade 9 science, math, and music. He had a B.Sc. (Biology/Geology), a B.Ed. (Elementary), and additional qualifications from the Ontario Ministry of Education.

Jade (high school teacher) had strong subject matter knowledge in science, like Dave, although she was a relatively new teacher. She was beginning her third year of science teaching at the high school level when this project started in the Fall of 1998.

As a facilitator/educational researcher of the group, I assumed a variety of roles in the group—organizer, challenger, resource person, change agent, facilitator of individual action research, reflective researcher, teacher, group facilitator, and source of personal support (Pedretti, 1996).

INITIAL EXPLORATIONS OF THE THEORY

The group met on a weekly, sometimes bi-weekly basis, over a six month period in 1999. Our initial meetings focussed on reading and discussing a variety of literature about MI theory. Our goal was to develop an understanding of the basic tenets of the theory and to explore how other educators have applied the theory in the context of their schools and classrooms.

After completing preliminary reading about the theory, I suggested we complete an MI

TABLE 1:
Howard Gardner's Multiple Intelligences Theory

Students bring different strengths to a learning situation and have different creative and problem-solving strengths.

1. **Logical-mathematical**
   Ability to discern numerical patterns; to effectively think with numbers; classify information and make inferences/reason
2. **Linguistic**
   Ability to use words effectively when speaking and writing; being sensitive to the power, meaning and flow of words
3. **Musical**
   Ability to appreciate and play with rhythm, pitch and timbre; appreciation of musical form/expressiveness
4. **Spatial**
   Strength in visual spatial reasoning: sensing patterns and orienting oneself or thinking based on those patterns
5. **Bodily-kinesthetic**
   Ability to sense, interpret and create patterns involving the whole body
6. **Interpersonal**
   Ability to interpret and accurately respond to the moods/behaviours of others
7. **Intrapersonal**
   Understanding one's own feelings (aware of personal strengths and weaknesses) and the ability to act on that understanding to guide behaviour
8. **Naturalistic**
   Ability to make sense of nature's complexities, to classify aspects of nature and sense relationships within and between those patterns.

theory self-exploration tool (National Education Association, 1996). Although the survey did not result in any surprises, it made us consider our strengths and weaknesses and whether or not they influence how we teach. As well, we learned much more about each of the intelligences.

Dave had previously attended a workshop session on MI theory and had developed a perspective on the theory that endured throughout the project. "I think that if you just dwell on a strength then that would boost confidence, but you lose out … I think it should be more of a well-rounding. If you have a weakness in an area, build it up and then that would make you a better person." The group agreed with this perspective and felt there was potential for weaker intelligences to be enhanced by capitalizing on stronger intelligences.

The group felt that placing a special emphasis on the development of the intra-personal intelligence could help students in engaging in self-discovery about how they were learning science and in using learn-to-learn skills, meta-cognitive activities that help the learner become more aware of what and how he/she is learning (Fogarty, 1997).

Another issue arose about the nature of the theory. Jade asked, "Does interest warrant intelligence?" The group agreed there were limits, as Gardner (1983) suggests, to how much an intelligence can be developed; however, an interest in using a particular intelligence could become a strong motivator for students. Intelligences are not uni-dimensional, and individuals may have varying aspects of an intelligence developed to differing degrees. An individual may have a strong appreciation for music and it may be an integral part of his life; however, he may not be able to play a musical instrument.

APPLYING MI THEORY TO PRACTICE

Early in the project, before applying MI theory to curriculum design, each of the teachers introduced the theory to his/her students and agreed to make it an explicit part of instruction. In understanding the theory students could reflect on their strengths and weaknesses as learners. Jade introduced the theory to her students in their first science lesson for the semester and was surprised to discover that "many of them knew the seven different kinds of smarts. Although they didn't use the technical names, they were very much aware that intelligences existed in many forms."

In another introductory activity Jade placed the names of several famous people on the board. Students had to confer with each other and select the two intelligent people from the following list: Wayne Gretzky, Albert Einstein, Marie Curie, Picasso, Gandhi, Mother Theresa, Shakespeare, Mozart, Hitler. As the class discussed the intelligences, they brainstormed their own names for each intelligence, abandoning the more technical names. For example, students referred to the verbal-linguistic intelligence as "word smart."

> *"…many of the students knew the seven different kinds of smarts…although they didn't use the technical names."*

Before applying MI theory in a systematic way, we developed some general guidelines or *principles of practice* for how we would implement the theory. Some examples of how these guidelines were translated into practice are offered in Table 2. More in-depth case studies of how the participants incorporated the theory into practice can be found in Goodnough (2001a, 2001b, in press-a).

WHAT DID WE LEARN ABOUT MI THEORY?

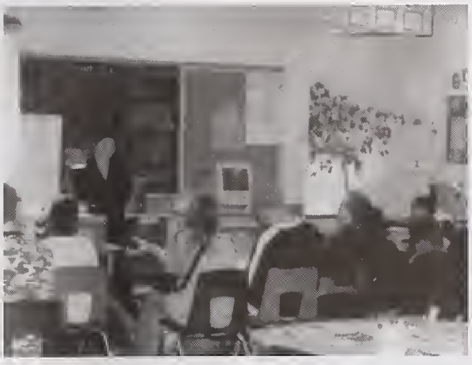
The teachers critically examined their pedagogical practices when teaching science. They explored their strengths and weaknesses and

TABLE 2: Guiding Principles

PRINCIPLE 1	**All intelligences should be targeted.** The participants were successful in targeting all of the intelligences throughout the project. They adopted a variety of teaching and learning strategies and usually engaged several intelligences in any one lesson. Many of the multi-modal approaches that were adopted included lecture; games; teacher demonstrations; Internet and library research; science process skills such as hypothesizing, predicting, observing, making inference, measuring and drawing conclusions; communication through reading, writing, and talking; graphic organizers such as Venn diagrams, concept maps and mind maps; creation of models, posters, and simple machines; inventions; raps; star gazing; journal writing; discussing of videos; experimentation; multimedia presentations; integration of software into the curriculum; visualizations; panel discussions; guest speakers; field trips; cooperative learning strategies such as jigsaw and think-pair-share; individual and peer assessments; and body graphs and other forms of graphs. During one learning episode, students participated in role-playing by becoming particles of matter. In this unit Jade capitalized on the bodily-kinesthetic (movement) and visual-spatial (drawings of states of matter) intelligences to foster student understanding of molecular motion.
PRINCIPLE 2	**Students should be encouraged to engage in meta-cognition about how they are learning, thus supporting the development of the intrapersonal intelligence.** After introducing the theory, students were asked to make regular journal entries about the intelligences and how these intelligences were helping them learn. Often, the participants would ask students to complete a PMI (plus, minus, and interesting points) about an activity. In other instances, students were asked to complete self-assessments of a piece of work they had completed. Dave had an opportunity to engage the intrapersonal intelligence in another way. During a one-week field trip to a nearby environmental centre, students participated in star gazing. As students were viewing the night skies, Dave relayed a Greek myth to the students and then asked them to spread out in a field, locating their own spots. "They laid down and listened as I reviewed the constellations and major stars. We then had about 15 minutes of silence and reflection."
PRINCIPLE 3	**Assessment approaches should be diversified, incorporating more performance-based and authentic forms of assessment to support a variety of intelligences.** While infusing MI theory into their science curricula, the teachers adopted a balanced approach to learning and assessment. Paper-and-pencil tests and assignments were used to test basic facts and skills; however, many of the formative and summative assessment tasks requiring more complex types of thinking were performance-based, allowing students to show how their knowledge, understanding, and skills could be applied in specific contexts. Dave, Celia and Ingrid used mind mapping, a graphic organizer that includes a central image, branching and sub-branching to develop ideas and concepts, and the use of key words, colour, and symbols (Buzan & Buzan, 1996) as formative assessment tools. Students created both individual and group mind maps, supporting the intrapersonal and interpersonal intelligences respectively. Other tasks required the teacher to establish criteria for performance-based assessments. This translated into the creation of rubrics, checklists, rating scales, and combinations of these for assessing student performance.
PRINCIPLE 4	**Students should be given choice in how they are learning and how they are being assessed.** By offering students choice in how they learned and were assessed, they could operate in an intelligence of strength. It was interesting to note that Dave's students, early in the study, when given a choice, engaged primarily the verbal-linguistic and logical-mathematical intelligences. Students' subsequent choices became more diversified and reflected tasks that engaged a wide range of intelligences.
PRINCIPLE 5	**Emphasis should be placed on fostering the interpersonal intelligence through cooperative and collaborative learning.** Encouraging students to share ideas and give each other feedback became a significant component of the participants' instruction and assessment approaches. Think Pair Share, Round Robin, and Jigsaw (Kagan, 1990; Johnson, Johnson, & Holubex, 1990) were some of the cooperative learning strategies adopted. In addition, students had several opportunities to present and explain their work to classmates. For the elementary teachers, this was an integral part of how they taught. In contrast, fostering the development of the interpersonal intelligence had not been a high priority with the high school teachers. As Jade said, "MI ... made me aware of where the gaps were." The participants believed that the teacher should not be the only conduit through which students receive feedback about their learning. Students also need to share ideas with each other when constructing their understanding of scientific concepts and principles and how this is personally and socially relevant.

identified areas they wanted to change or enhance. Celia had a highly developed musical-rhythmic intelligence, although she did not capitalize on this throughout the project. "I'm not sure why I haven't done more in this area, actually, except that I seem to be interested in a wide variety of things ... I feel ready to revert to focusing on areas in which I have a little more 'native' intelligence. I seem to have reached a point where I feel ready to create and devise some things myself now, using my strengths".

The teachers became far more cognizant of the learning needs of their students. MI theory became a "new lens to perceive students and a



new tool for acting on that information" (Campbell & Campbell, 1999, p. 10).

Teachers stretched their pedagogical repertories as they searched for the most effective means to integrate content and pedagogy. "I felt much more aware of the need both in myself to have variety, and for my students to have variety" (Celia). Dave reported that his entire approach to teaching changed. "In my teaching, by using an MI unit in science, or using MI for a science unit, it totally changed my approach to teaching and the way that I conducted the class." Dave became a facilitator of learning, a new role for him as a teacher.

Like any instructional approach that fosters active, student-centred learning, considerable demands were placed on the teachers' time. To design and implement multi-modal lessons that provide adequate time for all students to learn places pressure on teachers. Jade was greatly frustrated by a lack of time. There were 18 sections of Grade 9 science in her school and all teachers were expected to teach the same content, to use similar instructional approaches, and to adopt similar assessment procedures, within the same time frame, to ensure program consistency. Although Jade had input initially into the curriculum-making process, there was little flexibility during the school year to make changes.

Because MI codifies many good practices (Gardner, 1995), each of the participants had already been using many approaches to teaching and learning that were consistent with the theory. By the end of this study, we recognized that MI theory represents a philosophical stance to teaching and learning that fosters active, student-centred learning and acknowledges each person's unique cognitive profile.

MI theory offered the teachers a framework from which to examine their beliefs and practices about teaching and learning—provided a lens for exploring and enhancing *instructional intelligence*.

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REFLECTIONS ON THE MI COLLABORATIVE INQUIRY GROUP

"I found that one child, who's very low with skills, language and math, needed a bit of encouragement, and a mind map seemed the right approach. I had to remind her what it was, even though she had done a few, but then, she suddenly had 10 or 12 energy concepts on it. Some of it was not complicated stuff, just kinds of energy. But this is a child who, if you asked her to write everything she knew about energy, would be lucky to come up with one sentence. So I thought this was a great way of drawing the information out."

—Celia

"I compared the results of class work between the space unit and another unit done earlier in the year and found that the students had done significantly better on assignments. I'm convinced that is because students had the opportunity to work using intelligences in which they were strong."

—Dave

"So that's where I think my perspective has changed. I think that to be fair to all the learners, it is important to recognize that kids are not all verbal/linguistic, or mathematical/logical is valid. And I think before, especially before this, I would have doubted this ... So I'm listening to kids more, and I think that is so important."

—Jade

"Students benefitted from knowing there were different ways of learning, doing, and responding, and showing what they knew. I could especially see this at the end when they did their presentations."

—Ingrid

Instructional Intelligence:

A snapshot

John Mazurek

What does it take to make great music? A friend of mine, a music enthusiast, spent a year working in London, England. He relished the vibrant classical concert scene there: virtually every night of the week, there were opportunities to see top-notch performances by internationally renowned orchestras, chamber musicians and opera companies. Occasionally, after attending a superb concert, he would visit a local pub and encounter members of an orchestra or ensemble that he had just heard. He was surprised to find that a number of the players were openly disdainful of some of the pieces they had performed so beautifully, particularly the contemporary works. From their remarks, my friend inferred that these players didn't really understand modern repertoire, though they certainly had the considerable technical skills that it demanded.

Obviously, then, the players weren't the whole story behind the powerful performances. Three key elements must have come together in order for the great music to have been realized: (1) an imaginative composition, (2) a thoughtful understanding and interpretation of the composition, and (3) a technically polished translation of that interpretation into sound. Any two without the third wouldn't have worked.

My friend's experience prompted me to consider the parallels between these dimensions of music making and those of my own discipline, which is teaching. The result of great musicianship is great music. Effective teaching is demonstrated by optimal gains in student learning. Like musicianship, teaching requires technical skill, conceptual understanding and imagination. However, unlike most musicians, the teacher herself must embody all three dimensions: the effective educator, if you like, is a proficient composer, conductor and player rolled into one.

> *... the effective educator is a proficient composer, conductor and player rolled into one.*

We have all seen people who are experts in their fields of study but fail to convey their knowledge effectively in the classroom. In short, they aren't really teachers. Genuine "players" in the domain of teaching know how to engage the learner. Their command of pedagogical skills, tactics and strategies is the critical difference (e.g., knowledge of how to frame questions to maximize student participation, respond to inappropriate behaviour, facilitate productive peer interaction, etc.). And like expert singers or instrumentalists, expert teachers refine and expand their repertoire of performance methods through focused and continuous practice.

Effective teachers also "compose" their teaching performances. When planning, they know how to exploit their instructional repertoire to influence the rhythms, colour and balance of a lesson, school day, unit or overall program of study, and thereby, to maximize learning opportunities for their students. The strength of such decision-making depends on the teacher's understanding and consideration of "big ideas' (principles of motivation, learning styles, child development, etc.), as well as on knowledge of curricular content. Just as a composer plays with the phonic possibilities of various instruments, expert teachers understand the possible learning effects of a wide variety of instructional processes.

At the same time, thoughtful teachers realize that no plan, however carefully conceived, can be definitive in the classroom "moment." Like conductors, they constantly monitor, interpret and, if necessary, adjust the rhythm of the learning experience as it is occurring. We have all seen how inexpert teachers can be when they forget this fact, e.g., when they doggedly adhere to a prepackaged lesson from a prescribed program or manual despite obvious signs that students are confused or disinterested.

How can teachers act as effective composers, conductors and "players"—agents of powerful learning experiences for their students—within the everyday conditions of the typical classroom? What does such "instructionally intelligent" teaching look like? How can we get better at it? In this article, I want to explore these questions by examining a lesson that was designed and taught last year by Nicole Vitello, a teacher-candidate with whom I worked in the Toronto East Option of the OISE/UT Preservice Program.

As you read Nicole's lesson plan and her subsequent reflection/analysis of how the lesson unfolded, keep in mind that she completed this work with only six months of formal pre-service study and eight weeks of classroom teaching experience behind her.

The topic of Nicole's lesson was typical, everyday content. Her theme, paragraph construction, corresponded to a standard, overall writing expectation for Grade 3 in the Ontario Curriculum. What distinguished Nicole's teaching was the way she tackled this topic. She employed several specific instructional strategies and tactics, which allowed her to address a number of important pedagogical concepts related to motivation—accountability, active participation, emotional safety and appropriate level of difficulty, to name a few. She didn't just *hope* the students would be attentive to learning; rather, she deliberately invited that attention by weaving into her lesson multi-step processes like Lesson Design, Cooperative Learning and Concept Attainment, as well as simpler processes like Place mat, Round Robin and Think Pair Share. Her instructional repertoire gave her the tools to create an inventive, effective "composition"—a plan with multiple ways to meet the learning needs of her students.

In their book, *Beyond Monet*, Barrie Bennett and Carol Rolheiser argue that teachers need to be both consciously and unconsciously skilled. On one hand, "automatic" skills free up teachers' attention to think about and respond to novel and unpredictable events, which are necessary and inevitable features of a learning situation. On the other hand, teachers need to be consciously aware of their instructional decisions in order to understand why their lessons work or don't work. In the East Option, we challenge teacher candidates to clearly articulate and analyze the instructional processes that they use or could use in their lessons and activities. We believe that when candidates engage in this kind of focused reflection, they develop a better picture of the many teaching variables that interconnect and effect student learning.

Before Nicole wrote her reflection, even before she designed and taught her lesson, she was required to develop two sets of rubrics (1) which summarized her emerging understanding of the pedagogical processes of most consequence for student learning. The first set considers the teaching-learning dynamic from the perspective of two instructional frameworks: Madeline Hunter's Lesson Design strategy and David and Roger Johnson's "Learning Together" model of Cooperative Learning. The second set focuses on psychological dimensions of a lesson and is based on organizers such as Bloom's Taxonomy, Gardner's Multiple Intelligences theory, and Hunter's Six Characteristics of Motivation (Bennett & Rolheiser, 2001). In the East Option, we believe that the task of creating these kinds of rubrics involves teacher-candidates in specific thinking about what effective instruction could look like. It is also another way to help them to see how different aspects of teaching and learning intersect. We find that candidates who engage in the process are in a much better position to self-assess the quality of their teaching out in the field. As you read the excerpt from Nicole's rubrics, consider what organizers you use or could use to reflect on the effectiveness of your teaching.

From the "snapshot"—Nicole's lesson plan, reflection and rubric excerpt—what can we learn about instructional intelligence? First, we can notice that it involves facility with a range of instructional processes: skills, tactics, strategies, concepts and organizers. Briefly, let's look at a few examples of how Nicole demonstrates this facility in how she designs and carries out her lesson:

1. She applies instructional skills in a number of ways. For example, she provides her students with multiple models of accurate and inaccurately structured paragraphs. She also "chunks" complex tasks into discreet steps.
2. Likewise, a variety of instructional tactics are used: Think Pair Share; Round Robin; Say and Switch; T-chart; Place Mat, etc.
3. In addition, she employs at least three instructional strategies that are have been shown to have positive learning effects: Jigsaw, Concept Attainment, and the Johnsons's model of Cooperative Learning.
4. In her reflection, we can see how her planning decisions are informed by instructional concepts such as active participation and the motivational principles of safety and meaningfulness.
5. She uses Lesson Design as an instructional organizer or framework for her planning and reflection.

RUBRIC EXCERPT

LEVEL 4

Mental Set
- Organization is logical and effective
- Active involvement of all students
- Encourages all students to draw on knowledge base

Objective
- Stated in a manner appropriate for age level
- Clearly states what will be learned and how it will be accomplished
- Expectations are realistic and meaningful

Input
- Good/appropriate mix of student-teacher direction
- Provides for some levels of thinking
- Learning styles and multiple intelligences are thoughtfully considered

Modelling/Demonstration
- Presented in structured, organized manner
- Model is clearly, effectively related to other aspects

Check for Understanding
- Checks for understanding exist at all stages
- Partner, small group, class and teacher feedback

Practice
- Ample time given
- Clear, precise instructions
- Fully related to objective
- Active participation of all students

Closure/Extension
- All students summarize lesson (extensions included if necessary)

Cooperative Learning
- Positive interdependence was highly structured
- All students clearly demonstrated accountability for self and group members
- Social skills were taught practiced and processed effectively
- Appropriate and consistent opportunities were given for face-to-face interaction in C.L. tactics
- Teachers continually monitored group-work, documented observations, provided feedback on group functioning, and intervened when necessary

LESSON: **CONSTRUCTING PARAGRAPHS**
Age Group: Grade 3
Subject: Language Arts
Duration: 60 minutes

Objectives:

Ontario Curricular Expectation:

- Organize information into short paragraphs that contain a main idea and related details (Language: Writing: Grade 3)

Academic:

- Students will recall the three main parts of a paragraph by completing a Think Pair Share activity.
- Students will deepen their understanding of the function of each of these three parts by completing a Jigsaw activity.
- Students will apply their understanding of correct paragraph structure by completing an Concept Attainment activity and, in a pair or triad, constructing a short paragraph on a given topic.

Social:

- Students will demonstrate attentive listening during the above activities.
- Students will offer appropriate encouragement to their peers during the above activities.

Mental Set:

1. Students are seated in their home groups (4 groups of 4 and 2 groups of 5). With a partner, students use Think Pair Share to recall the three main parts of a sentence.
2. Each student is given a paper strip that contains a topic sentence, the first or second half of the body of a paragraph, or a closing sentence. Strips comprise parts of 3 different paragraphs:
   "Lima beans should be banned."
   "Homework should be a thing of the past."
   "Ants make the best pets."

There is one **yellow** and one **pink** copy of each strip of each paragraph. (An extra yellow copy is made for 2 of the closing sentences. These strips are given to the 2 ESL students.) All students within a home group receive strips of the same colour. The strips are distributed so that all 3 paragraphs are represented within each home group. Three special-needs students receive strips that have topic sentences.

Without talking, each student needs to find the three "missing" parts of his or her paragraph in the same colour. This results in 6 new groups: 4 of 4 students and 2 of 5 students. Each group assembles its paragraph and each student reads aloud his or her part to the other 3 (or 4) partners.

Sharing Objective and Purpose with Students:

- "You are going to work with the partners you have now. Then later, you'll work with your home team. One of your goals today is to figure out how all of the three parts of a paragraph work so that when you write in paragraphs (in your stories, in your reports, in your letters …) your ideas will make sense to your readers."
- "A second goal for today is to make sure that you are a 'wonderful group member' with your partners and your home team. Today, that means listening to your partners and team, and encouraging them so that everybody can learn lots about paragraphs."

Input:

- Quick review of T-chart on Attentive Listening and "cloud" posters of encouraging statements. Using Round Robin, each group identifies several ways that they can show ("do" and "say") these two social skills.
- After the Mental Set, a Jigsaw strategy is used. Each "new" group is asked to become "experts" on one of the three parts of a paragraph. First, each group receives an envelope which contains a Concept Attainment data set for that component. The data set includes:
  3 paragraphs (each on a separate **blue** paper cut-out): all have the designated paragraph component highlighted. In each sample, this component is used correctly ("yes" examples);
  3 paragraphs (each on a separate **green** paper cut-out): all have the designated paragraph component highlighted. In each sample, this component is used incorrectly ("no" examples);
  3 paragraphs (each on a separate **white** paper cut-out): all have the designated paragraph component highlighted. Two are "yes" examples; one is a "no" example: students must decide which is/are which ("testers").
- Next, each group receives a sheet that summarizes the key features of the component and provides one additional "yes" example.
- When "home" groups reconvene, the designated "expert(s)" for each component "teach(es)" their partners.

As I mentioned earlier, teachers need to have command of a variety of pedogogical skills, tactics and strategies in order to engage students effectively. Even at this early point in her journey as an educator, Nicole shows that she has an emerging repertoire of such processes. With more experience, of course, she will have opportunities to refine and broaden that repertoire. Still, in this particular lesson, she can do more than just "talk" about Place Mat, or "chunking," or Concept Attainment. She has begun to put those things into practice to the benefit of her students. We might say that she has begun to "walk" the talk, or to borrow an expression from the musical world, she has begun to develop "chops."

A second feature of instructional intelligence is the ability to combine and integrate these sorts of instructional processes in ways that are powerful for student learning. For example, as Nicole explains in her reflection, she makes a deliberate attempt to combine or "stack" the strategies of Jigsaw and Concept Attainment, along with the tactic of Think Pair Share, in order to effect a balance between individual accountability and safety (which are both instructional concepts). This "integrative" design creates opportunities for students to take charge of their learning: to access peer support (in the Think Pair Share) and "arm's length" teacher modelling (in the examples of "accurate" and "inaccurate" paragraphs in the Concept Attainment data set). In turn, the "safety" in the peer support situations is facilitated by the use of Cooperative Learning in the lesson, specifically the explicit attention to the social skill of "encouraging."

Contrast Nicole's approach with what a less thoughtful, "mechanistic" application of Jigsaw might look like. A student might be asked to read a page of a textbook on her own, then move to an "expert" group. However, because

Modelling:

- Guide all groups through the Concept Attainment process, step by step:

  Provide a focus statement: "Look at the blue and green paragraphs. Pay attention to the "dark" [highlighted] part of each paragraph and how it fits or doesn't fit with the rest of the paragraph. In all the blue examples, the "dark" part fits. In the green examples, the "dark" part doesn't fit with the rest of the paragraph."

  Have all students read all of the paragraphs. Partners may quietly help each other with particular words.

  Lead a Think Pair Share within each group after all the "yes" and "no" examples have been read. Have each group record a hypothesis: what are the key features of the component (2 or 3 points)? "What's the same about all the bold/dark sentences in the blue paragraphs?"

  Continue Think Pair Share: have each group (partners working in pairs or triads) make a decision for each tester; then each person shares that thinking with someone from the other pair or triad.

  Have each group revise its hypothesis, if necessary.

  Have each group compare its hypothesis with the summary sheet.

  Model appropriate appreciation/encouragement statements for each step.
- Guide all home groups through the "expert" sharing. Make sure that a Round Robin format is followed. Those who share the same component "teach" together. Show "experts" how they can check their partner's understanding after the "teaching." Finish the process with appreciation statements. Model appropriate statements for contributions as "expert" and "student."

Practice:

- Think Pair Share (in Mental Set)
- "Puzzle" paragraph/group formation (in Mental Set)
- Concept Attainment (guided Practice, as described above in Input and Modelling)
- Jigsaw "expert" teaching (as described above in Modelling)
- Partner Place Mat:

  After the Jigsaw, each home group receives a large sheet of paper, divided in half by a line. Students divide into pairs or triads on either side of the sheet.

  A chart is presented at the front of the room. It has blank spaces for the topic sentence and the closing sentence; the body of the paragraph is given. One person in each pair (or pair in the triads) must compose a suitable topic sentence. The other person must compose a suitable closing sentence.

  Have each pair/triad compare its sentences with another group's opening and closing sentences on the other "half" of the Place Mat.

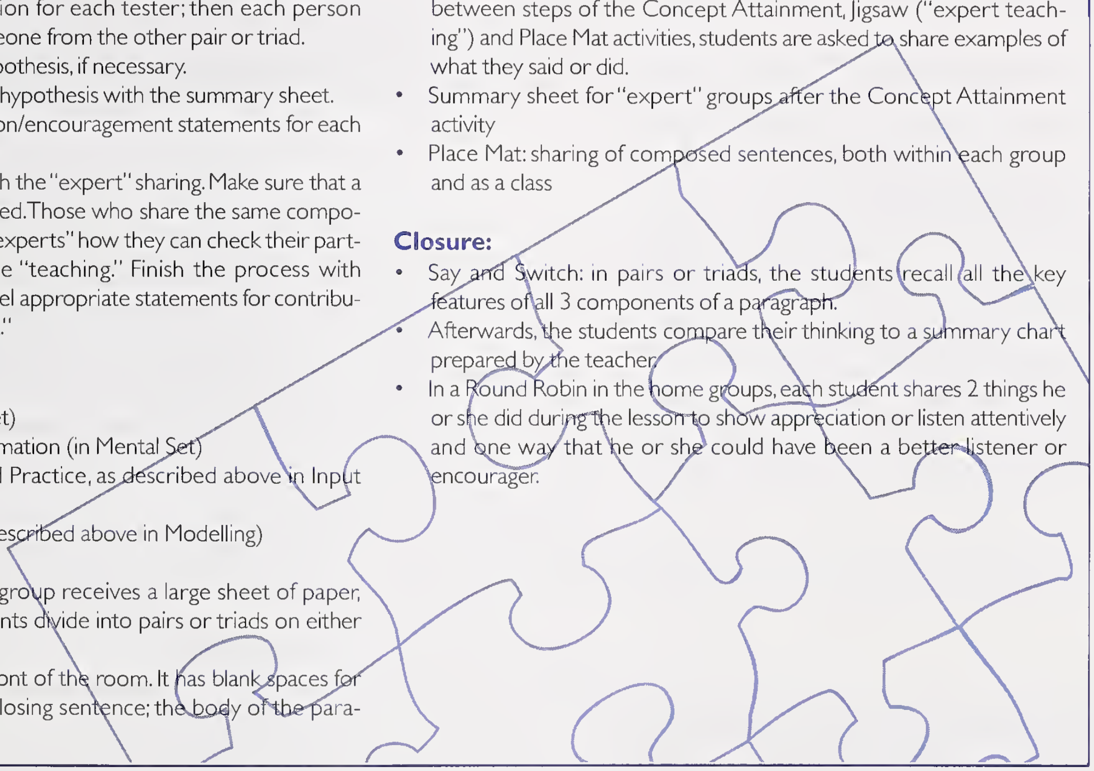
  Flip the sheet over. Repeat the process for another paragraph. This time, the chart gives the opening and closing sentences, but not the body of the paragraph. Partners take turns writing 3 or 4 suitable sentences for the body. Afterwards, compare with the other "half" of the Place Mat.

Check for Understanding:

- Think Pair Share (in Mental Set)
- Concept Attainment (as described in Input and Modelling)
- Random checks of appropriate appreciation and listening behaviours: between steps of the Concept Attainment, Jigsaw ("expert teaching") and Place Mat activities, students are asked to share examples of what they said or did.
- Summary sheet for "expert" groups after the Concept Attainment activity
- Place Mat: sharing of composed sentences, both within each group and as a class

Closure:

- Say and Switch: in pairs or triads, the students recall all the key features of all 3 components of a paragraph.
- Afterwards, the students compare their thinking to a summary chart prepared by the teacher.
- In a Round Robin in the home groups, each student shares 2 things he or she did during the lesson to show appreciation or listen attentively and one way that he or she could have been a better listener or encourager.



no provisions are made to include Think Pair Share, one student may dominate that group and others may loaf. Or, because no explicit attention to social skills exist, some students may feel uncomfortable sharing their thinking or asking their peers for advice. Others may become bored because the "page from the textbook" might not invite the curiosity and self-checking that is possible when Jigsaw is combined with a well-designed Concept Attainment data set. Obviously, thoughtful teaching isn't about using as many instructional processes as possible in every lesson, but it does involve creative "composing" (knowing how to develop instructional combinations that enhance student learning) and skillful "conducting" (knowing how to manage and adjust those combinations once the lesson or activity has begun). These sorts of creative decision-making require an understanding of who students are, how they learn, and what they are learning. Without this conceptual foundation, a teacher's instructional repertoire has no energy, no effect. Nicole's reflection shows that her instructional moves aren't based on a superficial fascination with the "tools" themselves (Place Mat, Jigsaw, etc.). Rather, her teaching decisions are driven by deeper considerations: for example, by what her students already know and don't know about paragraph structure and social skills, as well as by her own knowledge and understanding of what motivation is and how it works.

A third characteristic of instructional intelligence is an awareness of the importance of deliberate, ongoing practice and reflection. Thoughtful teachers find ways to learn from their classroom experiences in ways that less effective teachers do not. A teacher can learn most from their teaching when they are able to explain/analyze in what ways it is effective and ineffective. So, instructional intelligence

NICOLE'S REFLECTIONS: ONE YEAR LATER

The row-by-row seating arrangement: that was the first thing I noticed during my first visit to the Grade 3 classroom in which I would be completing my second practicum. I knew then that facilitating successful Cooperative Learning lessons during the relatively brief, five-week span of the placement would be challenging.

During the first two weeks of the practicum, it took much persistence to build the students' commitment to and skill with basic Cooperative Learning tactics like Think Pair Share in the simplest groupings (pairs and triads). These experiences made me wary of trying more complicated cooperative processes during the third week of the placement. By the fourth week, though, I felt that the children and I were ready to move forward and try some of them. I decided that we would use two "new" strategies: Concept Attainment and Jigsaw. In this lesson, I hoped to enhance the children's learning by combining the two strategies.

The Mental Set was very engaging and played a role in eliminating some of the fear the students may have associated with writing paragraphs. I thought it was important with a concept like paragraphs to break it down in small, comprehensive pieces so that everyone could experience a high level of success. The hands-on matching game achieved these goals. The social aspect of the activity really excited the students.

An important goal in planning the lesson was to design Input experiences that were mostly student directed. The Jigsaw strategy promoted accountability and a high level of interest. In a lesson one day prior to this one, I introduced the class to the strategy through a cooperative crossword puzzle activity. Within their cooperative groups, students were given a word clues. Then expert groups met to decipher the respective words. Finally, each student returned to his or her original group, and by "teaching" the word to his or her partners, helped the group to complete the crossword. This was effective way to show the students how valuable each group members' contributions can be. The activity fostered a positive feeling tone surrounding the concept of interdependence.

I had found in previous lessons that high accountability levels had sometimes compromised the safety of the learning environment. To prevent this from occurring in this lesson, I structured many avenues of peer support and many checks for understanding where students were encouraged to bounce ideas off one another in partners and triads.

It was quite a challenge to guide the students through the Concept Attainment process, which occurred in the Modelling component of my lesson. It would have been helpful to introduce this strategy in a preliminary lesson with an "easier," more familiar data set, similar to the way that I had introduced Jigsaw through the "easy" content of the crossword activity. The whole notion of being in charge of their learning and determining what was correct and incorrect in the data sets was a very novel and therefore difficult task for these students. My efforts to "chunk" the Concept Attainment steps in this lesson were somewhat helpful, but the procedures did cause some confusion and seemed to distract some children from the key concepts about paragraphs.

I focused on increasing the level of difficulty as the lesson progressed as displayed in the matching exercise occurring in the Mental Set, to the analysis in the Concept Attainment activity to the application in the partner Place Mat.

The Concept Attainment strategy required the students to find out for themselves what the sample paragraphs had in common. The activity appealed to many in the class who enjoyed "puzzle" games. Because Concept Attainment focused the students on pattern making and just one component of the paragraph, I think it helped them to gain a better understanding of the lesson content in less time than if I had tried a direct teaching method. The activity provided opportunities for peer discussion and teacher support. Some students struggled with accumulating characteristics for the hypothesis sheet and depended too much on their Think Pair Share partners for ideas. Upon reflection, I could have called a "time-out" at that point in the lesson and conducted a short mini-lesson to redirect those who were stuck.

The partner Place Mat activity was an effective way for the students to demonstrate their learning together within the home groups. It was interesting to see the differences in the triads' opening and closing sentences for the same paragraph "body." I was expecting some students to believe that differences were "wrong," that there was only one correct answer. However, this was not the case. The Concept Attainment activity seemed to help everyone appreciate that there was more than one way to create a "good" paragraph—that each sentence needed to be assessed on its own merits.

Checks for understanding existed at all stages of the lesson and appealed to a variety of learning styles. Feedback in the form of encouraging statements really supported the students' desire to contribute and take risks. Utilizing a summary sheet was a last-minute decision I made, but it proved to be extremely valuable tool for Closure – a self-check for the students and whole-class summary.

Unfortunately, I didn't get to the Round Robin that I had planned. Closure is the part of my lessons that often gets rushed. I need to devote more time to it. If students aren't given the opportunity to reflect on their experience, especially in regards to the social objectives of the lesson, an important opportunity for growth and goal setting is lost. When I was making anecdotal notes during the lessons I heard some negative and positive remarks that students said to one another that really surprised me. I should have had the students reflect on those comments. I could have found time for the Round Robin by limiting the partner Place Mat a bit. I could have had the students do just the first part of the activity (writing an opening and closing sentence) and left the second part (writing the "body" of a paragraph) as an opening to the next day's class.

involves not only practice and reflection, but also a commitment to being articulate about the teaching-learning process—to finding "common language" with others regarding what is known about that process. In this way, teachers can meaningfully discuss and learn from each other's work, not just their own. "Collective" instructional intelligence becomes a possibility.

In her lesson plan and reflection, Nicole uses terminology that refers her work beyond her classroom to a wider world of thinking and research about effective teaching and learning. Even at this early point in her journey as a teacher, the habit of clearly describing and reflecting on her instruction has helped her to make sense of some of the key ideas and patterns of our discipline. She is becoming accustomed to considering what she can learn about those ideas and patterns from her practice, and vice versa. In her reflection, for example, she identifies some difficulties that emerged during the Concept Attainment phase of her lesson. This leads her to consider an alternative process for introducing children to such a complex instructional strategy. She seems to find a possible solution in their earlier experience with Cooperative Learning, another strategy of considerable complexity. With more practice and focused reflection of this kind, she will undoubtedly deepen and broaden her understanding of instructional ideas, patterns and options—all of which will put

her into a better position to create effective learning environments for her students.

For Nicole as for us, the process of becoming instructionally intelligent is ever evolving. It requires an ongoing commitment to articulate our instructional practices and reflect on them with clarity and focus. Our students are never exactly the same, one to the other and one day to the next. There is always new repertoire to learn and refinements to make in our understanding and application of the skills, tactics, strategies and organizers we already use. There is a constant flow of new information, ideas and research that we can tap into as support for our instructional decisions. The creative possibilities of integrating instructional processes are endless.

One of our goals in the East Option is to facilitate teacher candidates' first steps toward instructional intelligence. Accordingly, we have developed a series of assignments to focus study, teaching practice and reflection on particular clusters of instructional skills, tactics, strategies and concepts. The "cluster" approach directs candidates' attention to processes that have a proven track record for enhancing student learning. In turn, this promotes a "common language" about instruction, and provides candidates with manageable targets for building repertoire. Each assignment involves actual classroom teaching, so no two candidates face the same set of problems to solve in applying the target "cluster." This arrangement pushes everyone to be creative—to experience instructional processes from multiple perspectives, i.e., as "composers," "conductors" and "players."

Nicole's lesson is an example of this creative problem solving: a "snapshot" of emerging instructional intelligence. As the year progresses, so does the challenge of the assignments: candidates are expected to integrate appropriately an increasingly complex repertoire. This work culminates in the final quarter of the program when they must design and teach an "instructionally intelligent" unit plan.

Does such a program focus make any difference to our graduates' teaching in the long run? Consider Nicole's comments, reflections after her first year in the classroom. Feedback of this sort give us reason to believe we are on the right track.

How does what we're doing at "teachers' college" to become knowledgeable about instruction compare with what you're doing in your classroom, school, and district? What would a snapshot look like in your context?

NICOLE'S ANALYSIS

When I first began learning about instructional processes, I struggled with the notion of labeling everything and keeping all the acronyms straight in my head. I questioned whether it was worth the effort. I could see (and continue to see) many effective educators "just doing it" without knowing the academic terms and pedagogical concepts that underlie their practices. Why not let teaching just happen naturally? Over time, my opinion has changed. I can only speak personally, and although I do not think I am by any means obsessive about labeling strategies and using proper terminology, I can see the value of really understanding and naming my instructional repertoire. I try to be aware of the strategies that I use so that when learning opportunities aren't being maximized I know what I haven't already tried and what alternatives are available to me. Also, I have found that keeping track of my instructional repertoire helps me to provide balance in my program. For example, I consciously use what I have learned about concepts of Motivation and Active Participation to guide my efforts to create engaging lessons. I know that when students are engaged, problems related to classroom management are significantly reduced.

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Nicole Vitello is in her second year of teaching at George Webster Elementary School in the Toronto District School Board. In 2000–01, she was a candidate in the East option of OISE/UT's Elementary Preservice Program.

John Mazurek is co-ordinator of the East Option of OISE/UT's Elementary Presence Program. He teaches without a baton.

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(1) The excerpt in the sidebar on p.17 is from Nicole's rubric concerning Lesson Design and Cooperative Learning. In part, her work draws from several sample rubrics she was shown in class—rubrics developed by our East Option teacher candidates in previous years. One of these samples, by Susan Gurney, was published in full in a previous issue of *Orbit* (Vol. 31, No. 4).

Teachers Talk About Instruction

Stephen E. Anderson

Instructional intelligence—conceptually intriguing, professionally appealing, yet empirically elusive. Just what does it mean for teachers to be instructionally intelligent? How is instructional intelligence demonstrated in teacher thought, talk, and practice?

One way of addressing the empirical gaps in our tacit understanding of instructional intelligence among teachers is to investigate the thought and practice of expert teachers, teachers deemed by their colleagues to be smart about teaching. In this article, I report some findings from a small-scale investigation of how expert secondary school teachers talk about instruction in their professional practice (Bennett, Anderson, and Evans, 1997).

A STUDY OF EXPERT TEACHERS

The study consisted of interviews with 16 secondary school teachers from two school districts in the metropolitan region of Toronto. Eight teachers were selected from each district based on their reputations among supervisors and colleagues as "effective" teachers. The teachers varied by subject specialty (e.g., mathematics, science, English, history, geography, French) and experience (from seven to 25 years).

We asked teachers to identify the instructional practices they routinely use in the classroom, to reflect on factors influencing their choice of practices, to describe how they had acquired their repertoire of instructional practices, and to talk about the integration of instructional practices in their teaching. The interviews were taped, transcribed, and shared with the teachers for validation.

We analyzed the interview data in two ways. First, we recorded all the instructional ideas and practices named by each teacher, and clustered the listed items into groups and relationships according to each teacher's description. We then incorporated the instructional ideas and practices named by each teacher into a generic framework for describing teachers' instructional repertoires as described below. This enabled us to compare responses across the teacher sample, while preserving the uniqueness of each teacher's talk about instruction.

Second, we wrote profiles of how each teacher described and explained their instructional repertoire in practice, and its evolution over time. We then developed propositions that described how the teachers think and talk about instruction. We compared, grouped, and refined the statements from each teacher, and re-tested their applicability to teacher profiles across the sample. This process resulted in 12 propositions about how expert teachers, those whom we might reasonably regard to be exemplars of instructional intelligence, think and talk about instruction.

This article examines these 12 propositions as a way of illuminating empirically the concept of instructional intelligence. Readers may wish to refer to the "Framework for Thinking About Instruction," which guided the study.

EXPERT TEACHERS TALK ABOUT INSTRUCTION

1. Teachers construct personal models for describing and explaining their instructional repertoires.

No teachers used a formal conceptual framework to characterize the universe of pedagogical practices that comprise their instructional repertoires. This finding resonates with the oft-cited absence of a commonly shared technical language of instruction among teachers (Lortie, 1975; Rosenholtz, 1989), and with Bruner's (1982) long-standing observation about the absence of a general theory of instruction as a guide to pedagogy. Possible frameworks, such as Joyce and Weil's "Models of Teaching" (1992) and Marzano's "Dimensions of Learning" (1992) did not form part of these teachers' spontaneous lexicon of instruction (awareness did not necessarily mean use).

Some teachers talked about instructional concepts, strategies, and tactics without communicating any overall sense of organization. Others presented "personal models" of their

One way of addressing the empirical gaps in our tacit understanding of instructional intelligence among teachers is to investigate the thought and practice of expert teachers, teachers deemed by their colleagues to be smart about teaching.

instructional repertoires. Several, organized their talk broadly in terms of more and less teacher-directed practices, or by contrasting large group practices (e.g., lecture, socratic dialogue) with practices that support student learning in small groups. Some offered more explicit personal models. For example, one English teacher distinguished "general strategies" (e.g., lecturettes, brainstorming, jigsaw) from others more specifically suited to specific domains of English language development—writing (e.g., "peer editing, timed writing"), reading ("graphic organizers, text highlighting"), and oral language use (e.g., "seminar presentations, oral sharing"). A science teacher used three general sets of practices—"chalk and talk," "group work," and "thinking skills material."

2. Teachers classify instructional practices along a continuum of more to less teacher directed.

This proposition approaches the status of an axiom for teachers in our sample. Yet each pole of the continuum has associations that go beyond mere variation in degree of teacher-centredness. Two science teachers and a mathematics teacher, for example, characterized instructional practices at the teacher-directed end as "traditional" or "old fashioned," and as limited to common large group teaching methods, such as "lecture," "chalk talk," and "socratic" questioning. They portrayed the instructional practices that they associated with more student-centred teaching as "more progressive," and more recent in their stories of instructional acquisition. These included a wide variety of cooperative learning strategies and tactics, and instructional practices associated with student inquiry and thinking skills beyond the level of rote learning. Two language teachers (English, French) spoke only of instructional practices typically characterized as student-centred. Other teachers gave lower priority to, but did not exclude the more teacher-directed components of their pedagogy. Two English teachers provided an alternative conception to the notion of a literal continuum from teacher to student-centred, old to new, and traditional to progressive teaching methods. They talked about integration of newly acquired instructional concepts and practices with existing practices.

A FRAMEWORK FOR THINKING ABOUT INSTRUCTION

Instruction—The ideas and actions that teachers use to shape student learning, and which teachers conventionally describe as "teaching." It represents one significant component of the teaching and learning process. Others would include such areas as content or curriculum expertise and classroom management expertise.

Instructional repertoire—The set of instructional ideas and practices that teachers select, apply, and reflect upon in their instructional planning and teaching (Fullan, Bennett, Rolheiser-Bennett, 1990).

Pedagogy—The ensemble of instructional concepts, skills, tactics, strategies, and organizers available to teachers to create learning environments that encourage students to learn.

Instructional concepts—General concepts which teachers often use to describe what they endeavor to enact in their teaching, such as "variety," "relevance," "humour," and "caring." Instructional concepts guide rather than prescribe specific courses of action.

Instructional organizers—Lenses through which teachers make sense of and design the teaching and learning process. Examples include Multiple Intelligences, learning styles, and Bloom's Cognitive Taxonomy.

Instructional strategies—Complex instructional practices that involve a sequence of steps for the teacher and students. These often have generic applicability across grade levels and subject areas. Examples include the jigsaw method of cooperative learning, mind mapping, concept attainment, and simulation. Other complex instructional strategies may be grounded in a particular curriculum area, such as guided reading or literature circles.

Instructional tactics—Actions that involve students and which are usually invoked by the teacher to achieve a specific purpose. Like strategies, tactics may involve steps; however, they are less complex than instructional strategies and are not designed to make as big an effect on student learning. Examples include de Bono's CoRT program (e.g., PMI [Plus, Minus, Interesting]; EBS [Examine Both Sides of an Argument]) and Kagan's simpler cooperative learning methods (e.g., Think Pair Share, Inside Outside Circles).

Instructional skills—Specific instructional actions of teachers that enhance learning. Examples include framing questions at different levels of complexity, checking for student understanding, and using visual aids.

Power—The size of effects on learning that can be expected for the use of particular instructional practices. Instructional skills, for example, are not as powerful as instructional strategies in their effects on student learning, although those skills are critical to effective use of strategies and tactics.

Instructional integration—The ways in which teachers combine instructional concepts, organizers, strategies, tactics, and skills in their instructional planning and teaching.

3. Teachers' knowledge of subject discipline informs their view and selection of instructional practices.

Not surprisingly, many of these teachers related their teaching practices to their subject matter specialties. For example, a science teacher identified "group work in labs, in write-ups of labs and in problem assignments" as standard instructional practice in science. A history teacher emphasized the use of instructional strategies such as "simulations, debates, and mock hearings" in teaching students to acquire information and think critically about historical issues. Both these teachers talked about instructional methods related to the process of learning in their discipline (e.g., scientific or historical inquiry), not merely to support subject content learning. In sum, Shulman's (1987) concept of "pedagogical content knowledge"—knowledge about effective ways of teaching within a particular area of curriculum—was a salient feature of the way these teachers thought about instruction and their repertoires of teaching practices. This feature of "instructional intelligence" was associated with their common stories of growth in expertise through professional learning experiences.

4. Teachers distinguish instructional practices in terms of their perceived effects on student learning.

All these teachers highlighted different instructional strategies or tactics in terms of their effects on student learning. This finding is a corollary to teachers' pedagogical content knowledge. For example, a history teacher differentiated between instructional practices that are appropriate to teaching content versus skills objectives in history. She talked about the use of teacher-directed practices to introduce new content, or for review (e.g., "writing notes on the board," "talking to an overhead," having "students just sitting, listening, and answering questions"). Two mathematics teachers contrasted the use of "lecture" and "chalk talk" to support "rote learning" of math concepts and skills, with the use of teaching strategies that engage students more collaboratively and actively in "problem solving" and "communication building in mathematics" (e.g., "jigsaw, small group assignments, mind mapping"). Teachers associated cooperative learning strategies and tactics with "higher levels of student participation," and with maximizing student learning through collaboration and talk. Several teachers identified the use of specific strategies to promote higher order thinking skills (e.g., concept attainment, student inquiry, debates). A few teachers talked about instructional practices appropriate for teaching social skills (e.g., Tribes strategies and tactics) versus those more suited to subject content and skills acquisition.

5. Teachers describe the instructional practices they use in terms of their fit with learner needs.

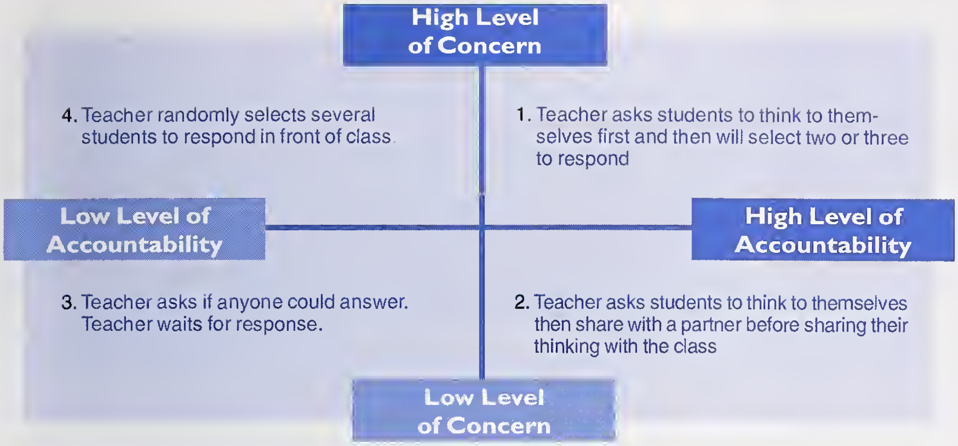
Many teachers in our sample did more than simply claim to adjust instruction to fit varying student needs. They described specific instructional practices as more or less appropriate to particular groups of students. A science and an English teacher, for example, talked about emphasizing Tribes strategies and tactics more with first year high school students in order to develop the social and collaborative skills required to participate successfully in upper grade classes. A mathematics teacher talked about using a greater variety of instructional methods, in particular cooperative learning, with younger students, and more teacher-directed large group instruction with senior students. Two science teachers reported that strategies suited to in-depth subject matter learning, such as concept formation and concept attainment, were more appropriate for upper grade students in advanced courses. One of these teachers stated that students in her general level courses had difficulty assimilating information from multiple sources with certain cooperative learning strategies (e.g., Jigsaw), while students in more academically advanced courses found some cooperative learning structures (e.g., gallery walk) overly simplistic. Several teachers talked about Multiple Intelligences as an emerging instructional organizer, and described ways in which they structured learning experiences for varied intelligences amongst their students. Finally, some teachers talked about progressions of instructional practices keyed to student development. One English teacher does not use Academic Controversy (a complex cooperative learning strategy) until students are comfortable with basic cooperative learning methods. Several teachers emphasized "relevance" for learners as an instructional concept underlying instructional and curriculum choices.

6. Teachers situate instructional practices in terms of alternative patterns of student interaction.

Most of the teachers distinguished between strategies and tactics appropriate to whole group, small group (including pairs), or individual instruction. A mathematics teacher talked about instructional fit with small groups organized by academic performance. Several teachers explained their use of cooperative learning strategies and tactics partly in terms of their desire to have students more actively engaged in the learning process, to have them talking with one another about their learning, and to teach them to work effectively with others. One English teacher distinguished between cooperative learning strategies that involve students in extended interaction over a period of time (e.g., "jigsaw, academic controversy") and those that engage students in brief interaction episodes (e.g., Think Pair Share). Another English teacher talked about linkages between instructional groupings and practices in the learning process. A typical lesson would involve teaching methods that enable students to "always work with somebody, always work with me, and then work by themselves."

7. Teachers distinguish instructional practices from student activities and approaches to learning.

Several teachers made a distinction between their teaching practices and student learning activities. This was manifested in two ways. For example, an English teacher distinguished between the kinds of tasks students are required to perform, like essay writing, and the instructional practices she might use to support that task activity—e.g., "brainstorming."



4. Teacher randomly selects several students to respond in front of class

1. Teacher asks students to think to themselves first and then will select two or three to respond

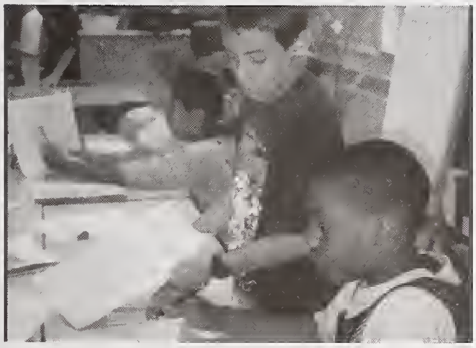
3. Teacher asks if anyone could answer. Teacher waits for response.

2. Teacher asks students to think to themselves then share with a partner before sharing their thinking with the class

"examining student models," "timed writing," and "peer editing." One of the science teachers contrasted "concepts of teaching" and "models of teaching" with students' "ways of learning," such as independent study or using computers as a learning tool. Second, several teachers referred to multiple intelligences and learning styles to describe how students approach learning, and then elaborated how they employ those ideas as instructional organizers in designing lessons.

8. Teachers identify and connect instructional practices in terms of their functions in an instructional process.

This proposition refers to a sub-sample of teachers who talked about instructional strategies and tactics in relation to others in an instructional process, rather than in isolation. One teacher, for example, not only identified an extensive list of instructional practices, she automatically discussed them in terms of "working together." She described how cooperative learning tactics such as "snowball" can be integrated with "four corners," or how one can start with concept attainment, flip to concept formation, and then follow that up with journal entries for reflection and self analysis. Another teacher emphasized the importance of linking multiple teaching practices to create meaningful progressions of learning activities for students, so that students always understand how what they are doing is contributing to their learning. That some teachers think about instruction (at least partly) in terms of sequences or combinations of compatible instructional practices suggests the possibility of a developing a syntax of instruction as a way of characterizing how teachers integrate instructional practices into combinations that yield "meaning" in student learning.



9. Teachers distinguish theory-based instructional practices from those which lack a pedagogical rationale.

This statement applied to several teachers who were highly committed to and involved in a long term district in-service priority on instructional excellence. Earlier in their careers their teaching was "hit or miss," "intuitive," and guided more by a sense of personal teaching style and interests than by any sense of underlying pedagogical theory or rationale. One was quite explicit in critiquing his former approach to instruction. He talked about "picking up neat ideas for different ways of doing things" at conferences and from colleagues which he would try out without understanding the pedagogy underlying their use. If they "worked" with his students he deemed them "successful." If not, they were discarded without much reflection on why. To illustrate, the teacher reported that small group work (e.g., "buzz groups") had long been part of his instructional repertoire, but until he learned about cooperative learning through the district in-service activities, he had no understanding of social theory that helps explain how students can learn effectively together, or of a range of instructional strategies (not just teaching tactics and student activities) applicable to cooperative group learning. Once he became aware of and experienced success with research-supported teaching methods, he began to abandon some of the informal instructional concepts and tactics picked up early in his career which appeared to have little pedagogical foundation, such as "everyday when you come to class you've got to surprise them."

10. Teachers make varying use of formal pedagogical language to describe their instructional repertoires.

By "formal pedagogical language" we mean terminology about instruction including instructional concepts like mental set, organizers like multiple intelligences or Bloom's Taxonomy, strategies like cooperative learning (e.g., jigsaw, group investigation and skills like modeling). Provincial curriculum documents represent another important source of knowledge about the language of instruction. Teachers, however, also talked about their instructional repertoires in more informal and less consensual terms, a situation which has contributed to the frequent claim that unlike many professions, teachers lack a shared technical language. Informal pedagogical language was most common at the level of general instructional concepts, such as "student involvement." "relevance," "fun," "variety," and "movement." Some informal terms were fairly common, such as "chalk and talk," "socratic," and "project work," and could be characterized as a professional argot. Most teachers had 15 or more years experience. For some older teachers, the use of formal pedagogical language seemed to be superimposed over a more informal and natural mode of talking about instruction. Several of these teachers, for example, talked about "collaborative strategies" and "group work" without much use of the technical terminology of cooperative group learning. Yet they easily related to these terms on a checklist of instructional practices at the end of their interviews. Not surprisingly, the use of formal pedagogical language was more prominent among teachers from a district in which there had been a multi-year in-service priority on instructional development. Finally, the use of formal pedagogical terms was mostly limited to the kinds of instructional practices teachers referred to as less teacher-directed, which involve more active participation on the part of students, and which challenge students to extend their knowledge beyond rote learning. In contrast, teachers used little formal language to describe their more teacher-directed large group methods of instruction.

11. Teachers vary in how explicitly they describe the different domains of their instructional repertoires.

Most teachers communicated a more robust and detailed language of teaching for instructional strategies and tactics, than for the more abstract domains of their instructional repertoire (instructional concepts and organizers). On the other hand, a few tended to link instructional concepts and organizers directly to instructional tactics without reference to specific instructional strategies that would support those learning activities. For example, one of the English teachers talked about the importance of incorporating "motivators" (an instructional concept) into every lesson, and gave illustrations of multiple tactics that served this purpose. Yet she did not appear to be working with a more general pedagogical theory or strategy of motivation. Similarly, a science teacher employed "thinking skills material" as an instructional concept, described the kinds of activities he would use to challenge students' thinking, but had little to say about instructional organizers or strategies related to teaching for understanding or critical and higher order thinking. Three teachers harked back in their careers to when they taught with little understanding or concept of teaching strategies. "You had a neat way of doing something, but you didn't often explore why it was neat or why it worked." This kind of instructional expertise is suggestive of teachers whose expertise consists of accumulation of specific instructional tactics (i.e., the proverbial bag-of-tricks) related to general instructional norms and concepts.

12. Teachers communicate varying mastery over the practices that comprise their instructional repertoires.

All of these expert teachers professed an openness to instructional innovation, and described periods in their professional careers of greater and lesser pedagogical learning and experimentation. They associated mastery over an increasing range of instructional practices with a greater sense of personal professional efficacy. A few talked about new or emerging focuses of pedagogical practice which they had not yet mastered. The instructional implications of multiple intelligences and of computer technologies in education were two salient areas of uncertainty. Others named specific instructional strategies which they had some experience with but had yet to master (e.g., concept attainment, portfolio assessment, guided imagery). For these teachers instructional intelligence was an emergent phenomenon, not a static state.

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What does it mean to be instructionally intelligent?

- Instructionally intelligent teachers are articulate about their instructional practices.
- They understand relationships between the instructional practices they employ and the subject matter they teach, the learning outcomes they seek, and the needs and characteristics of their students.
- They use that knowledge to make deliberate choices about teaching methods as they design learning experiences for their students.
- Over time they come to understand how different instructional practices work together to achieve their pedagogical aims.
- They draw from a practical professional knowledge base and from instructionally-relevant research to inform, guide, and create a language for talking about their instructional ideas and actions.
- Their instructional expertise is not a fixed body of knowledge. It is an emergent phenomenon in a constant state of growth, in which some ideas and actions are more fully developed and mastered than others at any point in time, and in which certain ideas and practices may be replaced by or reconfigured in light of others as their expertise expands and deepens.

— Based on interviews with expert teachers

Instructional Intelligence in Physical Education

Andy Anderson

INVITE STUDENTS TO PARTICIPATE IN A COLLECTIVE QUEST FOR UNDERSTANDING, AN UNDERSTANDING THAT IS A PERSONAL AND PROUD DISPLAY OF KNOWING FROM THE PERSPECTIVE OF THE CHILD.

Instructional competence involves the execution of a particular set of skills that is directed towards the organizational and managerial aspects of teaching—how to introduce lessons/topics, organize students into groups, present content in an orderly fashion. *Instructional intelligence* entails the adoption of a particular stance or disposition towards instruction that involves inquiry, analysis and reflection, both in and on the complexities and problems of practice. Instructional intelligence arises out the relationships teachers build with their students, other teachers, and the curiosities and experiences they have through trying to improve student learning.

Golf provides a good analogy. Intelligent golfers do more than exercise technical proficiency—i.e., strike the ball properly. Club selection and course management are essential elements of play that require both skill mastery and critical judgement. For example, they analyze course topography, the location of hazards, distance to the hole, hole placement on the green. These are all factors that must be "read" or interpreted when preparing to execute each shot. In other words, intelligent players consider the situation they are in before they decide what to do next.

> *Instructional intelligence involves paying attention to what happens while playing the game, listening to the players—yourself and others like you who are studying this process, and the students.*

Few golfers hit a hole in one. How can you tell whether or not the shot you just took is indeed "intelligent"? More likely the shot taken approximates or is closer to the hole than before, but in order to complete the hole it will require a second, third and in my case a fifth or sixth shot to finally drop the pill in the bucket. Each shot presents a whole new set of circumstances dependent on the results of the previous shot and the remaining distance to the hole. In some cases it is better to be cautious, to take an extra shot, rather than lose your ball in the water. Each shot is a calculated risk.

Like golf, decisions about instruction evolve and unfold as circumstances unfold. Intelligent educators know they will have to be prepared to adapt what they are doing to situations that arise, to the insights and questions students pose, and to the challenges and opportunities that emerge from moment to moment and week to week. Sometimes the best ideas about teaching are derived from inventing ways to teach when all other methods have proven fruitless. Sometimes, it's the students themselves who figure out what to try next.

Instructional intelligence is an intellectual process. Whether instruction is intelligent is not as easy as watching where a ball lands. Instructional effects vary. It involves probing deeply into the complexities and subtleties of the teaching/learning process. Intelligence grows out of a process of

Instructional intelligence involves inquiry about ...

Students' experiences with the content:

- What perceptions do students have of what it takes to be good at something?
- How do students feel about their ability to accomplish assigned tasks?
- What do students find difficult?
- How do fear, self doubt, self-consciousness interact with students' ability to learn?
- What are students really interested in at this age and stage of development?

The nature of the learning environment:

- How does grouping affect engagement?
- What routines facilitate involvement?
- What opportunities do students have to play leadership roles?
- How are students expected to contribute to the instructional process?

The nature of the subject matter:

- What are students really learning?
- Does engagement in the study of this content this way prepare students to lead a healthy active life?

Instructional activity:

- What are the characteristics/behaviours evident in my own teaching?
- In what form should content be represented to maximize learning?
- What relationship between students and the content is created through instruction?
- What methods are used by others who demonstrate exemplary practice teach?

conscious, systematic, and collective efforts to make progress. It involves paying attention to what happens while playing the game, listening to the players—yourself and others like you who are studying this process, and the students. It involves taking chances and being open to alternative and innovative ideas that emerge within the experience of teaching. Instructional intelligence is the ability to use what you know about effective instructional methods, content, students, and the learning process to facilitate both student and teacher learning.

APPLICATION TO PHYSICAL EDUCATION

Terry's story (below) portrays an experience playing baseball during school. What does this story tell us about his experience of physical education?

> *The basis are loaded. There's two out. I'm up to bat. I know I've just gotta hit that ball. The first ball comes to me. Easy, easy, looks good. I swing. The teachers yells out emphatically, STRIKE ONE. Okay, Terry, just wait. Take it easy. You don't have to swing. Maybe you could draw a walk to first base. Yeah, that could work. Here comes the ball. A little low, but I can hit it. I swing. STRIKE TWO! My heart is beating faster. "We want a batter," someone yells out. "C'mon Terry." My hands are getting sweaty. I tighten my grip and do a practice swing and then tap the bat on home plate for good luck. Please, God, help me hit the ball. Here it comes. Looks good, I swing. STRIKE THREE, you're out. My heart sinks. I knew I couldn't do it, why was I pretending?*
>
> (Anderson, 2001)

No task is more fundamental to teaching and the development of instructional intelligence than figuring out what students are thinking/learning about their experiences with content. This story presents evidence related to what is on this student's mind in this situation. Terry hopes for divine intervention. What does this suggest about what Terry believes is the reason for success and failure in physical education? What strategies would enable Terry to be more successful? Should students be placed in a situation in which they are "centre stage"? How does this situation pose a threat to the learner? What are the risks? What does this story tell us about how we should think about teaching physical education? How does getting students to share and reflect on their experiences enable us to learn to see the subject matter through the eyes, hearts, and minds of the learner, to be aware of the emotions, perceptions, imaginings, and translations students make of instructional inputs.

In his work on engagement in mathematics, Hawkins (1972/1974) argues that teachers must be able to notice when children's observations and questions take them "near to mathematically sacred ground" (p.113)—that is, to the edges of wonder or to core foundations. To be both responsive and responsible, "teachers need to live in multiple worlds, moving back and forth between the wider disciplinary culture with its conventions, norms, and theories, and the idea-filled worlds of their students. The teacher cannot belong entirely to any single world, 'but [must be] an ambassador from one to the other'" (Lampert, 1992, p. 310).

ACTIVITIES THAT NURTURE INSTRUCTIONAL INTELLIGENCE

The following activities are ways students and teachers can publicly share their ideas and insights, and develop a body of personal knowledge about the *experiences* of skill development, playing games, and the joy of movement.

Teach learning strategies

In my book, *The Missing Think*, I detail a number of learning strategies such as:

- picture words
- self-talk
- imagery
- goal setting

Self-talk, for example, enables students to focus on the key elements of performance, block out distractions, and self-direct improvement. Terry could have prepared to be a better batter by using self-talk, "Look at the seams on the ball, then throw your hands at the ball." Just prior to the pitch, Terry could simply repeat, "Seams, hands at ball." Students can create their own self-talk phrases and share these with others (Anderson, 1999). Discussions about the use of self-talk can be centered on questions about learning such as:

- What does self-talk help you to do?
- When are we most likely to use our inner voice?
- What words help you calm down/get ready?
- What would be a self-talk phrase to say to channel all your energy into an explosive move such as the standing long jump?

Situational information for teachers involves interpretations of:

Subject matter
What about this subject, matters educationally? What content will enable students to become physically educated?

Students
What are the characteristics, beliefs, needs, abilities of the students I teach?

Context
What sort of life do learners lead outside class, in the school yard, at home, in their communities?

Learning process
What is the process by which students develop health habits?

Pedagogical knowledge
What are the most effective ways to teach, organize learning environments, interact with students to maximize opportunities for student learning?

Pedagogical content knowledge
What do I know about organizing and presenting specific areas of content for learning? What are the difficulties associated with learning in this field?

Visually display their self-talk vocabulary of action and intensifier words. Create cartoon panels with pictures that depict different features of the body action and their self-talk phrases.

Say and switch

In pairs students take turns giving their responses to discussion starters. After one minute, switch, and the other partner speaks. After one minute, pairs engage in an open discussion about their ideas and insights. Discussion starters might be:

- When you throw the ball, what do you think about to ensure you use good technique?
- How would you change the game so you could play at home with your family?
- How might you play this game with friends after school?

Sample responses, shared with the entire class become an "insight bank."

Roundtable brainstorm

Students sit in a circle in groups of 3–4. Give each group a discussion card (e.g., What are some of the times when playing a sport feels really good? What are some of the times when playing a sport feels really bad? What kind of feedback really helps you progress?). Each person in the group must contribute to the discussion. After 2–3 minutes, one person from each group presents the group's ideas.

Brochure

Included in the brochure is a photograph of the student engaged in a movement activity along with their interpretations of what participation in this activity means to them. Some suggestions:

- This is a picture of me running fast.
- The best part about running is …
- The running activity we do in class that I like the best is …
- Good runners remember to …(arms), … (legs) … (other information).
- I use my running skills in games such as …
- This is a story about the feelings I get when I go running.

Graffiti wall

On a large sheet of paper along a wall attach scenario cards (examples below). Students, teachers and anyone visiting the school contributes their ideas. The results are powerful.

Scenario #1: When we play games everyone sees our achievements and our mistakes. During a soccer activity one of the students missed the ball. His/her friends laughed at him/her and after the game continued to tease him/her. What can we do to make sure we play in a safe environment free from teasing and put downs?

Scenario #2: Some physical activities are tremendously exciting. Jumping into the water off an overhanging rock at summer camp, tubing down a hill at a ski resort, whitewater rafting, spiking a volleyball, mountain biking over rough terrain, springboard diving are examples of thrilling activities. What physical activities do you participate in that you think are thrilling? Tell us what makes the experience thrilling.

Museum artifacts

Baseball gloves, skates, caps, skis, tennis racquet, and protective equipment buried in closets, basements or garages can be retrieved and put on display. Students can bring this equipment to life by creating stories that describe how, for example, an old glove was used to play first base for the county team, travelled to other parts of the country, rode on old buses alongside its owner every summer. How important was playing baseball to that young boy or girl's growing up years? What friendships were made and endure even today? What lessons about courage and determination were experienced? What was the most important thing that happened to that glove? Interview the people who used this equipment and retell their stories in class as part of a sports heritage theme. It is important for students to realize that they too are part of a collective history of playing the game. Every time they put on a pair of skates, pick up a racquet, step onto a diving board, they are experiencing the same sensations as others around the world and throughout history who play and love the game.

Family activity tree of physical activity

Create a genealogical chart. At the bottom students record their name and the physical activities they enjoy. Above are spaces for parents and extended family members to record the activities they enjoyed as a youngster and today as adults. List the reasons people enjoy activity—to be with friends, the thrill of the action, the joy of effort, the challenge of competition. Talk about the gift of sport and underlying values such as fair play and respect for others.

Social justice

Discuss how we can make games accessible to everyone regardless of age, economic circumstances, ability and race. What are some ways to change a game to make it more invitational for others to play? Play citizenry means finding ways for as many people to play as are interested. Brainstorm ways to make playground play inviting for everyone, ways to make community programs more accessible despite increasing costs due to user fees. Launch a campaign to give every child the opportunity to participate in school and community activity clubs.

Photo Voice

Invite 6–8 students to take 4–6 pictures in total, using disposable cameras, capturing both the essence of participation in physical movement experiences and things they believe are barriers to participation. Display the pictures with captions detailing their messages. Make sure students from various 'groups' are represented.

Invoking Active Participation

- Structure content and strategies that promote students' active involvement in learning (e.g., role playing, cooperative learning).
- Engage students at appropriate levels of difficulty (to experience success).
- Integrate other motivational concepts such as novelty, interest, meaning, authenticity, relevancy.
- Be visible (this increases the level of concern).
- Frame questions.

Writers/readers theatre

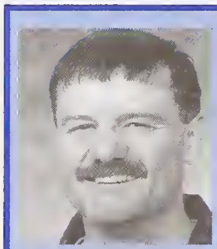
Students read out loud an exciting episode about sport or participation in an action event (book, magazine, story/essay from language arts) using dramatic gestures and an expressive voice and explain how this episode is inspirational.

FINAL REFLECTIONS

We need more cases, stories, narrative accounts of student thinking about the content in physical education. Fullan and Hargreaves (1992) say it this way:

> *We need to review … not just whether our questioning strategies keep students on task and in order, i.e., whether they "work" in this practical sense. We also need to review whether they develop higher order as well as lower order thinking skills, whether they favour "more able" over "less able" students, or whether they involve boys more than girls, etc. We need to reflect about these ethics and principles in our actions (p. 69).*

I encourage physical educators to invite students to participate in a collective quest for understanding, an understanding that is a personal and proud display of knowing from the perspective of the child.



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Graphic Organizers:

Visual tools for learning

Sandra McEwan • John Myers

At the beginning of each chapter Ms. Gagné's Grade 12 economics students skim the chapter to identify the main concept. Then in small groups they reread the chapter and create a team web linking the main concept to relevant information such as characteristics, applications and unresolved issues. The webs are posted around the room. Throughout the inquiry Ms. Gagné makes specific reference to the webs both when student ideas are confirmed and when they need correcting. At the end of the study the groups retrieve their webs and draw individual webs, taking into account the new learnings and their teachers' comments.

It's Thursday evening and Rob Sandhu has finished his research on Marc Garneau, Canada's first astronaut in space, for his Grade 6 science project. Now he takes the biography template of a stick figure his class uses for all of their biographical reports and organizes his research notes for inclusion in the written report. He first writes a paragraph on the background to space exploration, then highlights events in Garneau's life. Next, he describes the actual journey into space and Marc Garneau's thoughts and words about the trip. Finally, he concludes with a sentence on the significance of this trip for Canada's space efforts. Each part of the report corresponds to a section of the stick figure template: the ground representing "background," the legs representing "events in life's journey," the arms representing "deeds," the mouth representing "words" and the brain representing "concluding thoughts."

Skillful teachers have a repertoire of instructional processes they employ to meet learning goals. When these processes are consciously woven into the teaching/learning processes we demonstrate what some have called "strategic teaching" (Jones et al, 1986) and others have called "instructional intelligence" (Bennett & Rolheiser, 2001).

> *If students are able to show more independence as they use organizers and webs, if their language is precise, if they can explain their thinking, then these tools are working.*

WHAT AND WHY?

"Visual tools are symbols graphically linked by mental association to create a pattern of information and a form of knowledge about an idea" (Hyerle, 1996, 24).

"Some are less complex, like word webs and ranking ladders; others such as Mind Maps and Concept Maps are more complex. Inspiration is one software that can be used to create these tools" (Hyerle, 2001).

We employ them in our teaching because they work: they increase student achievement in a number of areas (Marzano, Pickering, and Pollock, 2001).

Graphic organizers, such as word webs and concept maps, help students generate ideas and make appropriate connections among important concepts. Other tools like the stick-figure biographical template help students organize information. Still others assist students as they evaluate and refine their own thinking (metacognition) such as ranking ladders and Venn diagrams. Such tools have become particularly important in promoting critical and meaningful reading and writing. (Billmeyer & Barton, 1998).

But let's take the 'why' one step further. Why don't we integrate multiple graphic organizers simultaneously? How might a Mind Map and a Concept Map merge? Could a Fish Bone incorporate a Venn Diagram and a Ranking Ladder? Could a Time Line be part of a Concept Map? And, would it be possible, in some cases, to integrate them all simultaneously? What does it mean to be instructionally intelligent when it comes to playing with graphic organizers?

In this next section, we start by sharing a few specific organizers, please note that there are many more. As you read through the specific examples, start to ask yourself: How could they be integrated? Later in the article, we will illustrate several ways that students have integrated two or more graphic organizers to illustrate their thinking.

Following are some organizers you can use in your teaching, K to adult.

GRAPHIC ORGANIZERS

Graphic organizers are visual frames used to represent and organize learning information. Graphic organizers expand many facets of students' higher-level thinking skills including analyzing, synthesizing, evaluating, relating and developing concepts, comparing and contrasting, categorizing and sequencing. These visual tools help students better understand the learning material, as well as sort out and expand their thought processes. Since students remember more of what they see and draw than what they hear and write, graphic organizers facilitate long-term retention of concepts. They also promote brain-compatible learning by seeking patterns and organization when making sense of information.

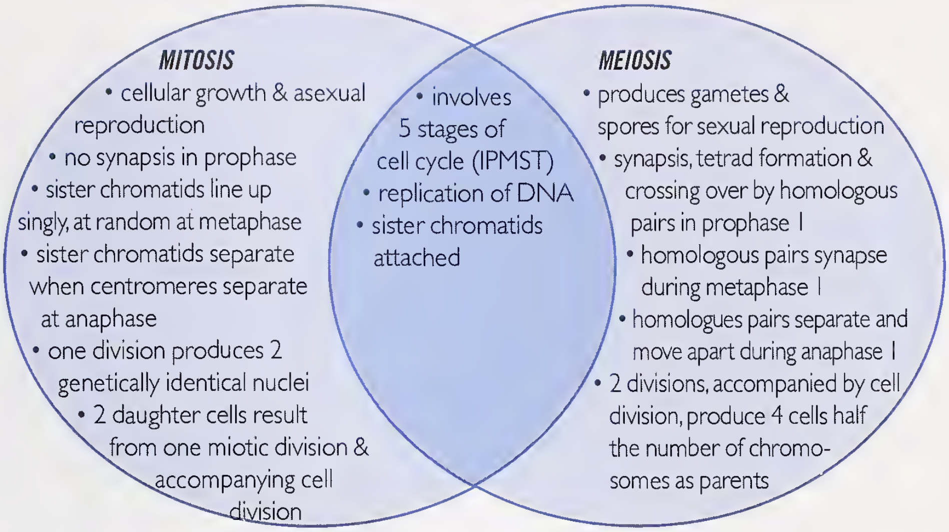
Graphic organizers engage four intelligences:

- Verbal/Linguistic—key words and phrases are selected for their organizers.
- Visual/Spatial—the learning material is organized into a visual format.
- Logical/Mathematical—logical processes such as hierarchy, sequencing, concept

development and cycles are often dealt with.
- Naturalist—such facets as categorizing, classifying, sequencing, comparing and contrasting are involved.
- Intrapersonal—knowledge about oneself.

There are over 30 types of graphic organizers (Table 1) that promote active learning. Each type is useful for certain concept relationships. Each can be adapted to the person or situation and can be used in any subject area.

Figure 1: **VENN DIAGRAM**


MITOSIS
• cellular growth & asexual reproduction
• no synapsis in prophase
• sister chromatids line up singly, at random at metaphase
• sister chromatids separate when centromeres separate at anaphase
• one division produces 2 genetically identical nuclei
• 2 daughter cells result from one miotic division & accompanying cell division
• involves 5 stages of cell cycle (IPMST)
• replication of DNA
• sister chromatids attached
MEIOSIS
• produces gametes & spores for sexual reproduction
• synapsis, tetrad formation & crossing over by homologous pairs in prophase I
• homologous pairs synapse during metaphase I
• homologues pairs separate and move apart during anaphase I
• 2 divisions, accompanied by cell division, produce 4 cells half the number of chromosomes as parents

Four examples of graphic organizers:

Venn Diagram—The purpose of a Venn diagram is to help students compare and contrast objects, concepts and ideas. Students brainstorm the similarities and differences of two objects, concepts and/or ideas. Common attributes are listed in the overlapping section of the Venn diagram. The unique attributes are entered in the non-overlapping sections (Figure 1). Alternatively, Venn diagrams can occur as two or more circles not touching, or as one circle within another circle, or as a combination of the two formats (Figure 2).

Fish Bone—The purpose of the fish bone is to help students identify separate causes and effects of a phenomenon. The problem is listed as an effect at the "head" of the fish. The long bone represents categories of causes. The short bones represent specific causes. Students brainstorm many possible causes. They rank the causes within each category (Figure 3).

Mind Map—A mind map organizes concepts into a coherent visual body of knowledge that forms a mental picture of what has been learned. A mind map which contains many relational links and coloured illustrations will enhance learning, recall and promote understanding of relationships between different concepts and ideas. They can be employed as either an introduction or closure to a lesson, or to check for understanding of material taught or read. An important spin-off is the question that can be asked related to connections between ideas and the mind map (Figure 4). The component parts are as follows (Buzan, 1993):
- *Defined Centre*—contains the central concept or topic.
- *Emphasis*—highlights the important information by use of bubbles, arrows, or wavy lines.
- *Colours*—aid in organizing different concepts and facilitate retention.
- *Key Words*—function as triggers to release additional and connected ideas.
- *Chains*—provide the connections or links to further establish and create relationships among ideas.
- *Visualizations*—are enhanced with illustrations, novelty of shape, and detail to facilitate retention.

Table 1: **CLASSIFICATION OF GRAPHIC ORGANIZERS**

Category	**Examples**
Sequence Organizers	chains, ladders, cycle graph, line graph
Compare/Contrast Organizers	venn diagrams, comparison charts
Concept Development Organizers	mind map, word web, concept map, concept chart
Relational Organizers	fish bone, target, pie chart
Categorize/Classify Organizers	pyramid, tree, matrix
Evaluation Organizers	PMI chart, agreement scale, evaluation scale

As illustrated in Figure 4, mapping involves a minimum of words. Images communicate meaning and they also precede words. Keep in mind that "a picture paints a thousand words." Students create mind maps that make sense to them.

Concept Map—A concept map is a visual representation that illustrates how one understands relationships between concepts (Figure 5). These concepts can be any combination of ideas, things, people, arguments, solutions, etc. Concept mapping takes the students beyond recalling facts. It encourages more complex and meaningful learning and aids in the retention of this information (Novak & Gowan, 1984).

The essential characteristics of a concept map are as follows:
1. Each map usually stems from one main concept.
2. Concept maps are generally hierarchical. The main concept usually starts at the top, or alternatively beginning at the bottom, or sides, or centre. With some major concepts, the radiating format works best for extending ideas.
3. The main idea branches to a number of related subordinate concepts called descriptors. They shift from more complex to less complex ideas, or most general to very specific ideas, or major ideas to minor ideas.

Figure 2: **VARIATIONS OF VENN DIAGRAMS**

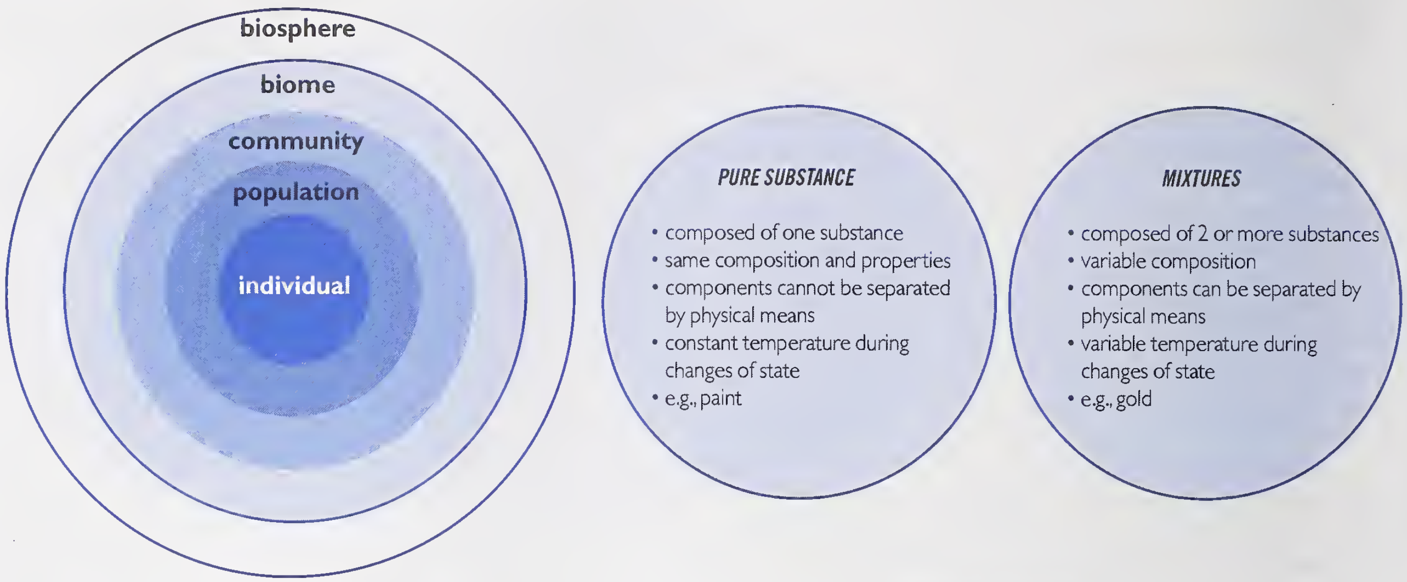
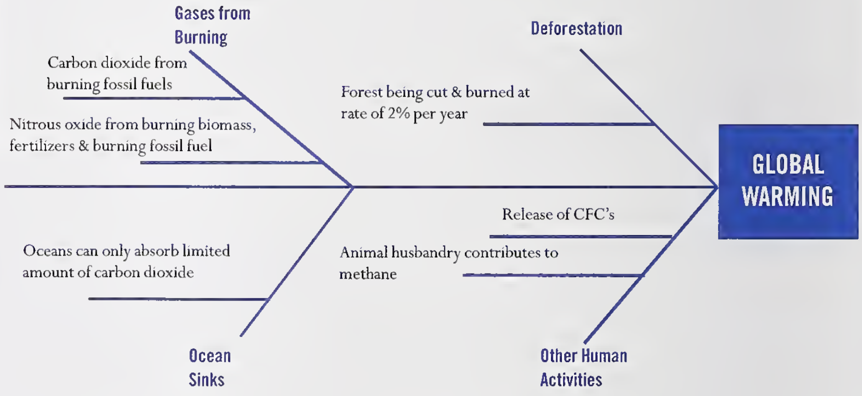

biosphere
biome
community
population
individual
PURE SUBSTANCE
• composed of one substance
• same composition and properties
• components cannot be separated by physical means
• constant temperature during changes of state
• e.g., paint
MIXTURES
• composed of 2 or more substances
• variable composition
• components can be separated by physical means
• variable temperature during changes of state
• e.g., gold

Figure 3: **GLOBAL WARMING**


Gases from Burning
Carbon dioxide from burning fossil fuels
Nitrous oxide from burning biomass, fertilizers & burning fossil fuel
Deforestation
Forest being cut & burned at rate of 2% per year
GLOBAL WARMING
Release of CFC's
Oceans can only absorb limited amount of carbon dioxide
Animal husbandry contributes to methane
Ocean Sinks
Other Human Activities

4. Descriptors are usually nouns, which in turn can be objects, symbols, events, or relationships.
5. Examples are often included to illustrate descriptors.
6. Descriptors are linked by connectors which can be verbs, adverbs, or prepositions.
7. Cross-links join descriptors in different parts of the map. These connecting lines and arrows should NOT cross.
8. When two descriptors and the linking connector are isolated, a complex thought or sentence should result.
9. Unlike mind maps, they seldom employ colour or visual aids.

The descriptors may be decided by the teacher, possibly through brainstorming with the students, or by the students alone. The connectors and/or arrows are usually contributed by the students. Alternatively, a predetermined structure can be given to the students. In a "Connector Only" map, the concept, descriptors and linking lines are already in place but the direction of the links and the connectors are missing. In a "Descriptor Only" map, the concept, connectors and linking lines are already in place but the direction of the links and the descriptors are missing. For special needs students, a "Shape Matching Only" map involves matching the shapes of descriptors and connectors on a template and drawing in the linking arrows. Similarly with the "Word Matching Only" map, the entire structure is provided except for the arrows. A list of descriptors and connectors is provided but separate from the organizational structure.

Concept maps can be used by students of all ages, noting that younger students will need more help. Concept mapping serves to increase students' abilities to organize and represent thoughts in ways which are truly meaningful to them. Concept maps can be employed in a variety of ways:

- to activate and assess prior-knowledge of a topic:
- to retrieve and assess post-knowledge of a topic that was taught
- to consolidate the learner's knowledge base;
- to summarize class notes and readings;
- to find connecting patterns between readings;
- to review a homework activity;
- to diagnose a student's understanding of a concept.

Success with concept mapping depends both on the conceptual understanding of the students and their previous experiences.

Figure 4: **MIND MAP**

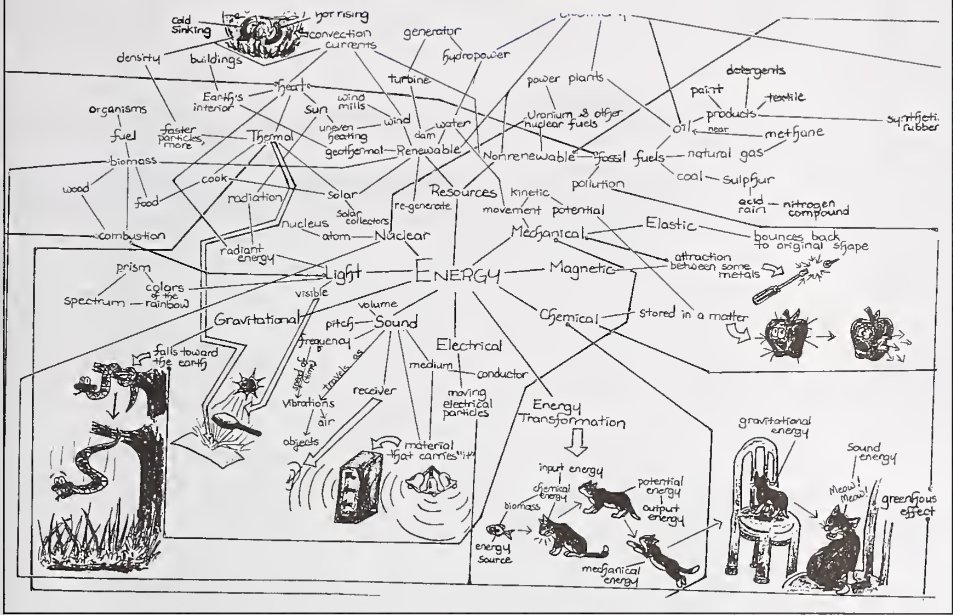
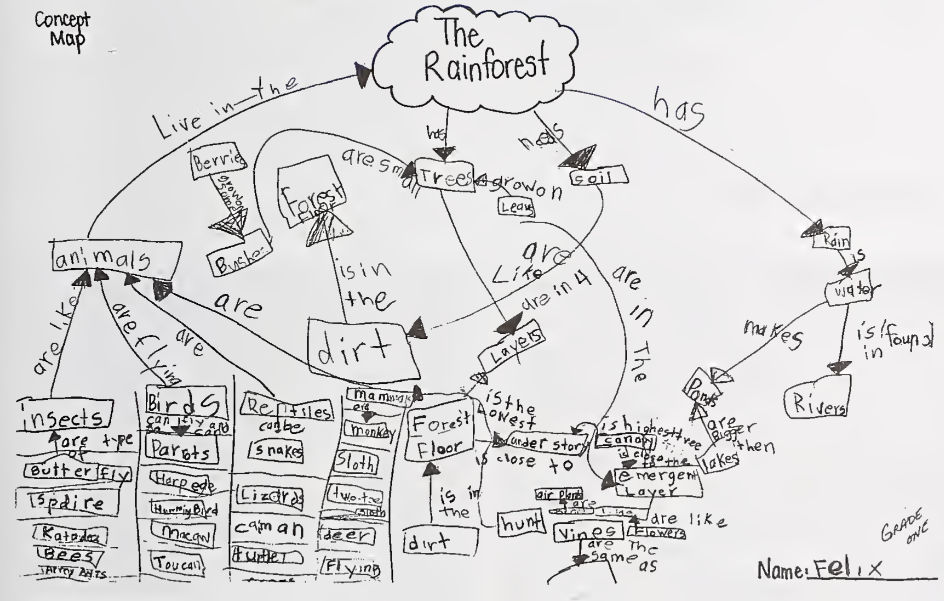


Figure 5: **CONCEPT MAP**



Assessment of maps should take this into account, especially if the results are to be used in a summative fashion.

Complex Organizers

Even more powerful is incorporating mind maps, concept maps, Venn diagrams, fish bones, flow charts, word webs, etc., in the SAME graphic organizer and completed as a cooperative activity (see *Figures 6 and 7*). This would now encourage both interpersonal and intrapersonal intelligences. Higher level thinking skills and social can be integrated while promoting different learning styles. You can decide the mix and match to fit the specific instructional targets of a lesson.

ASSESSMENT AND EVALUATION

There are several approaches that can be taken to assess and evaluate student work using visual tools. These include the following:

- In group-based graphic organizers such as mind maps or team webs, have each student use a different coloured marker to identify who did what. For example, Ms. Gagné could tell who were the concrete and who were the abstract thinkers by matching the colours students used to the comments they made in the team webs.
- As metacognitive thinking and content-organizing tools, such organizers help students assess their own efforts and make the appropriate adjustments in order to improve their own work. These include purely visual tools such as participation pies (Morton, 1996) and more textual organizers such as rubrics.
- Rubrics are great tools for helping students assess their own work. There are several useful rubrics for assessing mind maps (Bennett and Rolhieser, 2001, 291, 294; Hyerle, 1996, 116; Hyerle, 2001, 118).

Perhaps the most powerful assessment tools are your own metacognitive powers as you watch students use them. If students are able to show more independence as they use organizers and webs, if their language is precise, if they can explain their thinking, then these tools are working. However, if students are using the same tools in the same ways over and over again or if students cannot use visual tools to self assess and then improve upon their work, you need to change your approach.

We have talked about and illustrated four types of graphic organizers. And without question they are powerful on their own. The question we asked earlier was, why not integrate two or more. In Figures 6,7, and 8 you see how other graphic organizers can be integrated into Concept Maps. Can you find them?

CONCLUDING COMMENTS

Visual tools help teachers and students demonstrate and improve their learning through processes Howard Gardner calls "intelligence" (1983) and what Robert Sternberg refers to as "mental self management" (1997). Outside of schools such tools are being used to help adults organize their own work, to guide visitors to virtual museum collections on the web.*

We invite you to take advantage of visual tools to promote quality teaching and quality learning. ■

Figure 6: **COMPLEX ORGANIZER**

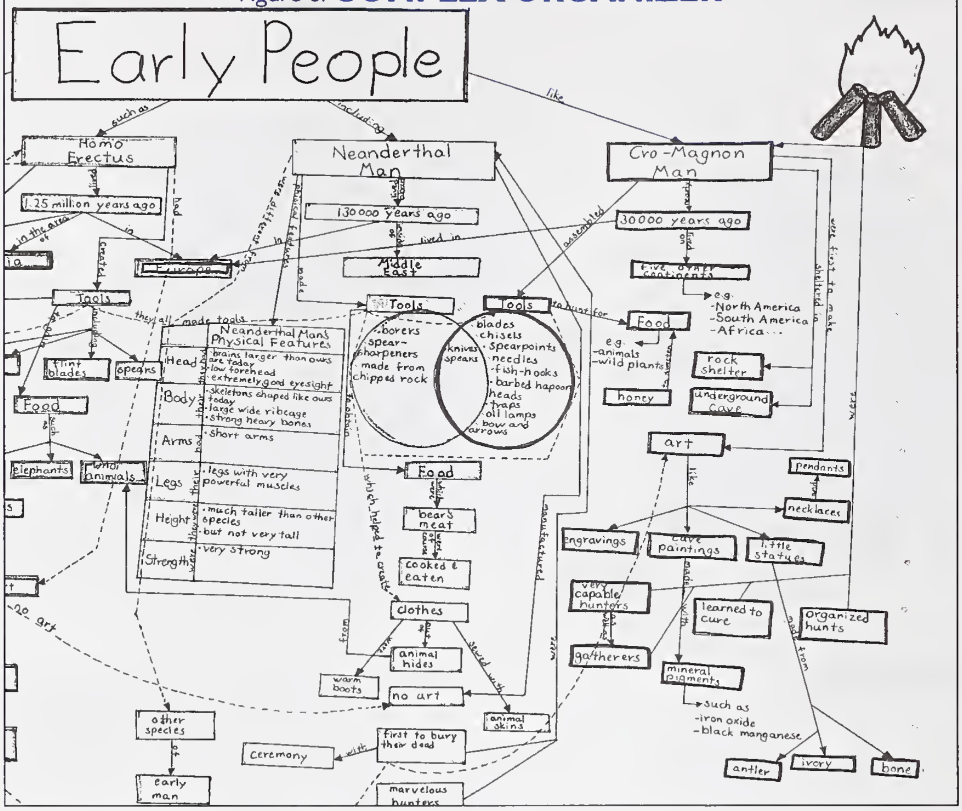
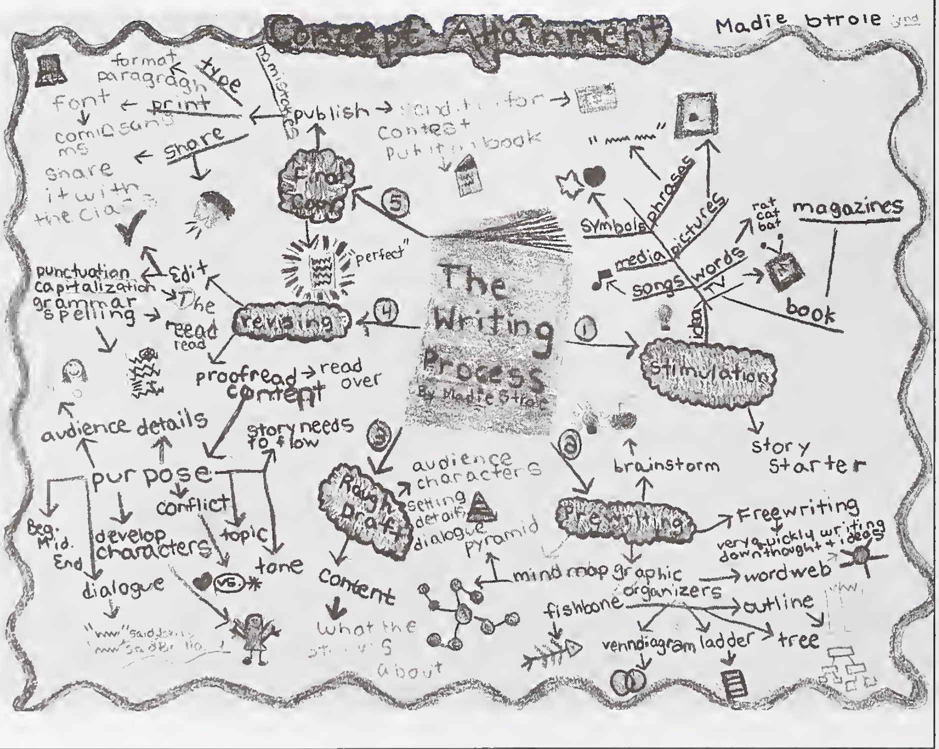


Figure 7: **COMPLEX ORGANIZER**



* For example, La Musée McCord in Montreal is setting up a graphic organizer on its Web site to help visitors locate and organize information for their virtual tours and studies (http://www.mccord-museum.qc.ca)

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Questions as Technology

Questions and questioning may be the most powerful technologies of all

Jamie McKenzie

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North American schools are spending billions bringing networked computers into schools while neglecting the most important technology of all—the ability of students to make meaning by applying sharply honed questioning skills. [1]

This article contends that questions and questioning (*mindware*) are critically important human technologies that might enable young people to solve problems, make smart decisions and score well on the tests of life as well all the other tests that loom in a child's world. They are at the heart of developing intelligent behaviour. Without strong questioning skills, information technologies contribute little to understanding or insight. There is even some chance that they might dilute understanding and interfere with thinking.

PART ONE

This section explores the importance of questioning while warning against an upsurge of Mentalsoftness^{TM}.

What is so important about questions and questioning?

Questions allow young people to make sense of their worlds and to take action smartly. They are the most powerful tools we have for making decisions and solving problems—for inventing, changing and improving our lives as well as the lives of others.

Questioning is central to learning, growing and acting. An unquestioning mind is condemned to "feeding" on the ideas and solutions of others. An unquestioning mind may have little defense against the data smog so typical of life in this information age.[2] An unquestioning mind is too much like a rudderless sloop swept along by storm swelled currents.

> The scientific mind does not so much provide the right answers as ask the right questions.
>
> *Claude Lévi-Strauss*

In a democratic society, questions empower citizens to challenge authority to do the most good for the most people.

In a fascist society, questions and questioning are viewed with suspicion. Questions are discouraged unless they remain within "safe" zones such as science and technology. In the popular children's series, Harry Potter is denied the right to ask questions by foster parents who find his asking threatening and disrespectful.

Questions enable the next generations to make changes in society, to invent new and better ways of doing things. They are the "mindware" that enable us to weigh the value of other tools, determining the best uses for computers, networks, databases, books and other media.

Life is such a puzzle—countless fragments confounding us like a huge jigsaw laid out on the table of our lives.

Each day we return to the table. We struggle to move the pieces around until some picture emerges, until we discover a pattern or a trend, until we can make sense of nonsense. We wrestle with the information flow and flux. We squint. We frown. We dig. We probe. We sift and sort.

We reach into our questioning tool kit to find the right net, lasso or scalpel to bring us closer to some truth[3] that may serve us well—provided we have a sufficient tool kit to address the challenge with some skill.

Because the new information landscape is streaming by at supersonic speeds, we find ourselves working overtime to "get our minds around" the essential issues, trends and data of our times. Making meaning is harder than ever before.

Supersonic speeds? We open our e-mail and watch a stream of messages flow into our mailboxes. Some of them are correspondence, some of them spam and many of them information "alerts" we have set in motion by subscribing to many of the services that may be tailored to our interests and needs. It is hard to keep up with this torrent.

Quick fixes, wizards and templates abound as substitutes for deeper understanding, but the ultimate answer to information abundance and degradation is unrelenting pondering and questioning. The better we are at interpreting the data and challenging the assumptions behind them, the greater our chances of handling the riddles, the conundrums and the paradoxes that are so prevalent. Questions make it possible.

I. Coping with Info-Glut and Charlatans

When students turn to their desktops for

> We live in a world where there is more and more information, and less and less meaning.
>
> *Jean Baudrillard*

information, they often find millions of documents within a single "mouse click." Are they worth reading? Will they satisfy their curiosity? Cast light on their biggest concerns?

Looking for financial projections? The future of the stock market? The health of our economy? They uncover thousands of documents. Amateurs and writers with doubtful credentials created many of these documents. Many predictions contradict the augury of others. Divination is widely practiced but poorly supervised. The Greeks may have done better with their omens, with their seers, prophets and soothsayers, but we must "suffer fools" and wade through the fortune telling and visioning of prophets who are both unlicensed and unschooled.

How can students sort and sift their way past the charlatans and self anointed frauds of this new electronic marketplace? How will they protect themselves from the deceitful?

For those who work in schools, how do we raise young people capable of finding their way through this maze?

Powerful questioning is the answer.

Powerful questioning leads to *Information Power*[4]—the ability to use information to fashion solutions, decisions and plans that are original, cogent, practical and effective.

When students come to a Web page or an online article, they should immediately ask who put it there and whether their ideas can be trusted. They must also challenge the author of a book. What about their background, experience, and bias? What about their funding, their track record, and their reputation? [5]

None of us can be expert in everything. To some extent we must rely upon others to help us interpret the world, but we must also be wary of "experts" lacking in wisdom, discretion or reliability. We cannot take the time to conduct original, primary source research each time we look for good ideas. We must turn to the sages.

Prior to the Internet, "experts" usually had to pay dues and win various licenses or credentials. It was difficult to win "air time" without passing through some kind of scrutiny or review.

The Internet has made the life of charlatans much easier. We find Web sites proudly dispensing hogwash and blather of the worst kind—history that isn't history and medicine that isn't medicine.

We open e-mail "stock tips" from spammers who are paid to recommend securities. We visit search engines and directories that spotlight information that has paid for "shelf space." In the 1950s, this was called "payola" and thought of as bribery. At the start of this new century it is a simple fact of e-commerce that advice is often tainted by conflicts of interests and questionable partnerships.

II. Matters of Definition

Why have we allowed technology companies to misappropriate the word "technology," applying it primarily to tools that plug into the wall and operate on electrical power? Why do we create a special subject area in schools separate from the real classrooms and call it "technology?" Why do we set up skill listings, tests and outcome statements that encourage the use of electronic tools apart from curriculum content?

> In the animal kingdom, the rule is, eat or be eaten; in the human kingdom, define or be defined.
>
> *Thomas Szasz*

How can anyone justify Spread Sheeting divorced from real questions as a worthwhile endeavor? The same can be asked about Power Pointing and Internetting.

Yet we see this trendy approach to information, to technologies and (almost accidentally) to learning sweeping through schools with little opposition or concern. Being good at technology, we are assured, is crucial if we wish a comfortable future for our children. If they stand a chance at a dotcom job, so the reasoning goes, then they need to be good at technology.

Definitions help to sell product. They carve out territory. They help to establish turf. They focus the spotlight. They shape budgets and priorities. And they sometimes distort planning.

15 DIMENSIONS OF CRITICAL THOUGHT

Affective Skills

1. thinking independently
2. developing insight into egocentricity or sociocentricity
3. exercising fair-mindedness
4. exploring thoughts underlying feelings and feelings underlying thoughts
5. developing intellectual humility and suspending judgement

Cognitive — Macro-abilities

6. clarifying issues, conclusions or beliefs
7. clarifying and analyzing the meanings of words or phrases
8. developing criteria for evaluation: clarifying values and standards
9. evaluating the credibility of sources of information
10. analyzing or evaluating arguments, interpretations, beliefs or theories
11. listening critically: the art of silent dialogue

Cognitive — Micro-skills

12. noting significant similarities and differences
13. distinguishing relevant from irrelevant facts
14. making plausible inferences, predictions or interpretations
15. evaluating evidence and alleged facts

III. Simple Answers to Complex Questions

In all too many cases, the questioning process has been reduced and oversimplified to a search for prepackaged answers. Artificial intelligence abounds.

Questions are intended to provoke thought and inspire reflection, but all too often the process is short circuited by the simple answer, the quick truth or the appealing placebo.

With the advent of new electronic technologies, our young people are threatened by a weakening of thought and an emphasis on the glib or superficial. Mentalsoftness™ is a new social "virus" that is rarely noticed. We hear complaints of a "new plagiarism," but few commentators remark upon the ascendancy of superficial thought.[6]

We know that the most important questions in life defy such formulaic responses. We also know that recipe books require frequent revision in times of rapid change. Strong questioning skills fuel and steer the inventive process required to "cook up" something new. Without such skills, our students become prisoners of conventional wisdom and the trend or bandwagon of the day.

Synthesis—the development of new possibilities by modifying and rearranging elements—cannot be managed without analysis—the probing, questioning process that explores the underlying principles, characteristics and possibilities of any given situation. Analysis is the underpinning of new thinking and wise choices.

If we hope to see inventive thought infused with critical judgment, questions and questioning must become a priority of schooling and must gain recognition as a supremely important technology. We must lay aside the forked branches of earlier times, the divining rods of soothsayers, technologists and futurists. Rather than reading the entrails or taking the omens to determine the future, we wield powerful questions as tools to construct a future of our own choosing.

PART TWO

This section proposes a major expansion of school research activities to emphasize daily questioning, exploration and independent thought.

Which questions are central to schooling?

Smart questions are essential technology for those who venture onto the Information Highway. Without strong questioning skills, students are mere passengers on someone else's tour bus. They may be on the highway, but someone else is doing the driving. Without strong questioning skills, students are unlikely to exercise profitable search strategies that enable them to cut past the info-glut, info-garbage and info-glitz that all too often impede the search for Insight.

Sometimes this new information landscape seems more like Eliot's Waste Land than a library, more like a yard sale than a gold mine. The weaker the questioning and learning skills, the less value one is likely to discover or uncover.

> Once you have learned how to ask relevant and appropriate questions, you have learned how to learn and no one can keep you from learning whatever you want or need to know.
>
> *Neil Postman and Charles Weingartner*

Schools without a strong commitment to student questioning and research are wasting their money if they install expensive networks linking classrooms to rich electronic information resources.

As long as schools are primarily about teaching rather than learning, there is little need for expanded information capabilities. Since many schools and publishers have spent decades compressing and compacting human knowledge into efficient packages and delivery systems like textbooks and lectures, they may not be prepared for a new information landscape that calls for independent thinking, exploration, invention and intuitive navigation.

If districts do not commit as much as 25 percent of their hardware expenditures to curriculum revision and staff development with a focus upon student questioning and research, they are likely to suffer from the Screensaver Disease.[7]

I. Prime Questions: Which questions matter most? Most important thinking requires one of these three Prime Questions:

1. Why?

Why do things happen the way they do? This question requires analysis of cause-and-effect and the relationship between variables. It leads naturally to problem-solving (the How question) or to decision-making (the Which is best question.)

"Why?" is the favorite question of four-year-olds. It is the basic tool for figuring stuff out. At one point while researching student questioning in one prominent district, I found "Why?" occurred most often in kindergarten classrooms and least often in the high school (which had the highest SAT scores in the state).

Prime Indicators of MentalSoftness™

1. Fondness for clichés and clichéd thinking—simple statements that are time worn, familiar and likely to carry surface appeal.
2. Reliance upon maxims—truisms, platitudes, banalities and hackneyed sayings—to handle demanding, complex situations requiring thought and careful consideration.
3. Appetite for bromides—the quick fix, the easy answer, the sugar coated pill, the great escape, the short cut, the template, the cheat sheet.
4. Preference for platitudes—near truths, slogans, jingles, catch phrases and buzzwords.
5. Vulnerability to propaganda, demagoguery and mass movements based on appeals to emotions, fears and prejudice.
6. Impatience with thorough and dispassionate analysis.
7. Eagerness to join some crowd or mob or other—wear, do and think what is fashionable, cool, hip, fab, or the opposite or whatever ...
8. Hunger for vivid and dramatic packaging.
9. Fascination with the story, the play, the drama, the show, the episode and the epic rather than the idea, the question, the argument, the premise, the logic or the substance. We're not talking good stories or songlines here. We're talking pulp fiction.
10. Enchantment with cults, personalities, celebrities, chat, gossip, hype, speculation, buzz and blather.

- Why does the sun fall each day?
- Why does the rain fall?
- Why do some people throw garbage out their car windows?
- Why do some people steal?
- Why do some people treat their children badly?
- Why can't I ask more questions in school?

2. How?

How could things be made better? This question is the basis for problem-solving and synthesis. Using questions to pull and change things around until a new, better version emerges.

- *How?* is the inventor's favourite question.
- *How?* is the tool that fixes the broken furnace and changes the way we get cash from a bank.
- *How?* inspires the software folks to keep sending us upgrades and hardware folks to create faster chips.
- *How?* is the question that enables the suitor to capture his or her lover's heart.
- *How?* is the reformer's passion and the hero's faith.

3. Which?

Which do I select? This question requires thoughtful decision-making—a reasoned choice based upon explicit (clearly stated) criteria and evidence. Which? is the most important question of all because it determines who we become.

- Which school or trade will I pick for myself?
- Which path will I follow?

Faced with a moral dilemma, Which path will I follow?

Confronted by a serious illness, Which treatment will I choose for myself?

II. What happens in most schools?

There have always been plenty of questions in schools, but most of them have come from the teacher, often at the rate of one question every 2–3 seconds.

> Two roads diverged in a yellow wood,
> And sorry I could not travel both
> And be one traveler, long I stood
>
> *Robert Frost*

Unfortunately, these rapid-fire questions are not the questions we need to encourage because they tend to be RECALL questions rather than questions requiring higher level thought.

The most important questions of all are those asked by students as they try to make sense out their worlds. These are the questions that enable students to make up their own minds.

Powerful questions—smart questions, if you will—are the foundation for Information Power,[8] Engaged Learning[9] and Information Literacy.[10]

Sadly, most studies of classroom exchanges in the past few decades report that student questions are an endangered species (Hyman, 1980; Goodlad, 1984; Sizer, 1984).[11]

Information-savvy schools should adopt a basic questioning tool kit and then blend it explicitly into each curriculum area where such skills belong. This tool kit should be printed in large type on posters that reside on classroom walls close by networked, information-rich computers.

Portions of the questioning tool kit should be introduced as early as Kindergarten so that students bring powerful questioning technologies and techniques with them as they arrive in high school.

III. Make Research and Questioning a Daily Expectation

Unless the school makes research and questioning central, the networked technology will be used rarely and tangentially, with a tendency toward special events and trivia rather than bread and butter issues. Rank and file teachers want to see more than virtual field trips and fanciful tours of distant continents. They want to see activities that pay off in higher scores and better performance.

The first step is to make research a daily event in every child's life, not just something that happens once a year in February or March when we suddenly devote several weeks to a major project. Research is the best practice for the kinds of questioning and reasoning described earlier.

While there are many ways to increase the frequency of student investigations, the following three strategies are offered as examples of possibilities.

The Year Long Project
"Five Hundred Miles"

Each student starts the year by identifying a leader, a celebrity, a crisis, a hobby or some other aspect of life that interests them enough to devote nine months to its study.

Each student becomes an expert on her or his subject and is ultimately expected to convert the expertise into an authentic product.

Elements of a Year Long Research Project

1. Selection—Each student settles on one field of interest and identifies one particular aspect worthy of tracking.
2. Questioning—Rather than gathering all information regarding the subject, the student will form key questions so that only pertinent information is retained.
3. Storage—This is an opportunity to design an efficient information storage and retrieval system so that the student can sort, sift and interpret even after collecting hundreds of records.
4. Prospecting—Early in the project, the student surveys the information landscape and identifies all relevant, reliable sites. If possible, the student sets up an automated flow (push technology).
5. Monitoring—The student keeps an eye on daily and weekly developments, periodically visiting sites that have expanding resources but no "alert" capability. The student frequently updates sources as new ones emerge or old ones fold.
6. Responding to inquiries—The student has a chance to demonstrate expertise by responding to questions from peers and others either personally or through e-mail.
7. Creating a product—The student shares insight by developing a product of some kind related to the subject. The product should require original thought, data compression and synthesis.

A full description of how to manage such projects is online at http://fno.org/500miles/persistence.html

Essential Questions in Every Unit

Each time a teacher introduces a new unit, the class is shown five or more essential questions and asked to explore one of them during the unit or build one of her or his own (subject to teacher approval). These are questions that touch our hearts and souls. They are central to our lives. They help to define what it means to be human.[12]

Most important thought during our lives will centre on such essential questions.

If we were to draw a cluster diagram of the Questioning Tool kit, essential questions would be at the center of all the other types of questions. All the other questions and questioning skills serve the purpose of "casting light upon" or illuminating essential questions.

Most essential questions are interdisciplinary in nature. They cut across the lines created by schools and scholars to mark the terrain of departments and disciplines.

Essential questions probe the deepest issues confronting us … complex and baffling matters which elude simple answers:

- Life
- Death
- Marriage
- Identity
- Purpose
- Betrayal
- Honour
- Integrity
- Courage
- Temptation
- Faith
- Leadership
- Addiction
- Invention
- Inspiration

The greatest novels, the greatest plays the greatest songs and the greatest paintings all explore essential questions in some manner.

Essential questions are at the heart of the search for Truth.

Essential questions offer the organizing focus for a unit. If the history class will spend a month on a topic such as Western settlement, students explore the events and the experience with a mind toward casting light upon one of the following questions, or they develop Essential Questions of their own …

- Why do people move onto other people's lands?
- Are there any decent and good ways to settle on other people's lands?
- In what cases did Canadian settlements violate and damage local peoples?
- How can humans avoid conflicts between cultures that lead to pain, suffering, destruction and death?
- Some say Canada still has unfinished business with regard to settlement. In what ways might this claim be true and in what ways untrue? What evidence can you supply to substantiate your case?
- If you were Prime Minister, what programs and policies would you set in motion to address issues that linger with regard to settlement?

The Daily Research Question

Each day begins with students walking into the classroom to note an intriguing research question on the board—puzzles, riddles and curious questions that can be answered reasonably well without months of study. These should require some thought and ingenuity, not be mere trivial pursuits. They should be highly motivating and captivating.

SCORING HIGH ON PROVINCIAL TESTS

Frequent practice on challenging questions prepares students to handle the inferential reasoning now required by most of the new provincial tests tied to tough curriculum standards. [13]

EVERY STUDENT SKILLED AT QUESTIONING

To be a successful thinker, reader and writer, each student must know how to make skillful use of a questioning tool kit—a set of questioning strategies that will make it possible to explore the most important questions of life.

In these days of gleaming desktops and whatever.com, one rarely thinks of questions as technology, but the main antidote to Mentalsoftness™ is powerful, unrelenting questioning.

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Jamie McKenzie is a graduate of Yale, Columbia and Rutgers Universities. He is the founder of FNO Press, a technology oriented publishing company and the editor of *From Now On—The Educational Technology Journal.*

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[1] In *Technology in Education 1999.* Market Data Retrieval estimates U.S. school technology spending at $5.5 billion in 1998-99. http://www.schooldata.com/pr18.html

[2] David Schenk describes the threats posed by too much information in *Data Smog: Coping with Info-Glut.* (1997) New York: Harper Edge.

[3] Truth is written here in lower case to signify a personal rather than universal notion. One woman's truth may be another person's lie.

[4] *Information Power* is also the name of a 1998 publication by the American Association of School Librarians et al.

[5] Kathy Schrock offers an excellent list of Web evaluation tools at http://discoveryschool.com/schrockguide/

[6] "The New Plagiarism," From Now On, May, 1998. http://fno.org/may98/cov98may.html

[7] We are talking about the educational equivalent of educational red ink - the observable failure of schools to actually use their expensive network or computers to any meaningful extent because they are not seen as part of the school's primary mission. In all too many places that mission is defined primarily in terms of covering the curriculum (rapidly) and preparing students to score well on various state tests.

[8] Information Power is a 1998 publication mentioned earlier.

[9] *Engaged Learning* is a model developed by Barbara Means and others that places a premium on students working in teams to solve problems with well developed strategies. http://www.d118.s-cook.k12.il.us/el/

[10] There are many different models for *information literacy.* One of the best reviews of these models is *Information Literacy: a Review of the Research* by David Loertscher and Blanche Woolls. Hi Willow Research and Publishing, 1999.

[11] Goodlad, J. (1984). *A Place Called School.* Hightstown, NJ: McGraw-Hill. Sizer, Theodore. (1984). Horace's Compromise. Boston: Houghton Mifflin Company. Hyman, R. (1980). "Fielding Student Questions." *Theory into Practice;* 1, pp. 38-44.

[12] The initial work on essential questions was done by Grant Wiggins and others during the 1980s in association with the Coalition of Essential Schools. Valuable resources may be found at http://www.essentialschools.org/fieldbook/strategies/curriculum/equestions.html

[13] An expanded explanation of these strategies is available online in "Scoring High," in the April, 1999 issue of *From Now On* at http://fno.org/apr99/scoring.html

Outside Organizations:

Can they affect instructional change?

Jerry L.Waddle

The Regional Professional Development Center (RPDC) at Southeast Missouri State University in Cape Girardeau is one of nine such centres established in Missouri in 1995, as a result of state reform legislation. This RPDC serves 75 school districts, most of which have less than 2,000 students. Its role is to provide professional development related to school improvement.

The reform literature of the last several decades has advocated the expansion and redesign of professional development for teachers and school leaders (see References). This redesign has been described by many researchers to have key components such as:

- significant collaboration
- job embedded programs
- extends over long periods of time;
- significant involvement of school leadership.

In 1998 we established a Teachers' Academy which incorporated these features. We were attempting to move away from the traditional one-shot, one-day, drive-in conferences that were having little or no impact on the practice of the teachers and administrators in our area.

DESIGN OF THE ACADEMY

As you can see from the above information, we are an "outside-inside" organization. Our position regarding supporting change is similar to most outside consultants or organizations. We cannot directly influence instructional change within schools and within districts. This creates a tension between what we know makes a difference and what we can actually do about what we know. What we can do is act on as much as we can related to what we know about how to improve classrooms, schools, and districts and from that assess the impact. We can also find out where educators are making a difference and see how that can guide our thinking and actions.

Barrie Bennett at OISE/UT was contracted to be the facilitator for the Academy. The first was held in June, 1998 with 54 teachers and 11 principals from 11 different schools attending. In July, 1999 a Cooperative Learning Institute was added. Staff developers from the Durham District School Board (awarded the Carl Bertelsmann Prize in 1996) facilitated the training. In 2001 four content-specific institutes were added with the facilitators for these institutes being highly skilled teachers from Southeast Missouri who had participated in the Academy and/or the Cooperative Learning Institute. By this time, 423 teachers and administrators had participated in the first four Academies and 194 having participated in the first three Cooperative Learning Institutes.

Teachers were required to attend in teams of four to six from the same school, accompanied by their building principal; four days a week during June with two follow-up days during the following school year. When the school year started in August, participants were asked to use some of the innovations in their classrooms and be prepared to present examples of their best lessons or students' best work at the follow-up sessions and teachers and principals were asked to meet regularly.

The instructional innovations introduced and practiced during the Academy were:

- cooperative learning
- concept attainment
- lesson design
- inductive thinking
- mind mapping
- concept mapping
- Venn diagrams
- questioning techniques
- Bloom's taxonomy
- Multiple Intelligences
- brain research.

EVALUATION OF THE ACADEMY

The designers of the Teacher's Academy recently conducted an evaluation in an effort to assess:

(a) To what extent did the teachers change their practice in the classroom?
(b) What factors in the design of the Academy contributed to implementation of the teaching methods in the classroom?
(c) What methods were implemented to a greater extent and why?

The evaluation employed sampling and open-ended interviews of participating teachers and principals to collect data for the study. Student work samples and instructional materials were also examined.

The study indicated that the teachers interviewed did change their practices by utilizing many of the instructional methods. One middle school teacher said, "I use Multiple Intelligences and Bloom's taxonomy and link them to the strategies. I have begun to tier and layer the strategies." Another teacher indicated that she uses Bloom's taxonomy to develop her questioning skills. "Where do questions fit on Bloom's taxonomy?" She said she is now better at asking higher-level questions. One teacher stated, "I teach special education and use cooperative learning in all subject areas. I now teach more complex concepts than I did before, because I have more effective ways of teaching them." Both teachers and administrators indicated that there were fewer worksheets being used and classrooms were less teacher centred.

Participants were somewhat divided on the most beneficial elements of the Academy design. Most agreed that the hands-on, modeling, and interactive nature were very important, also the involvement of the principal, attending in teams, and the follow-up sessions. The accountability of having to attend the follow-up sessions and having to share their best lesson or students' best work increased implementation. Four of the six principals interviewed stated that principal involvement and support was critical to implementation in the classroom.

Teachers and administrators identified three major benefits to students:

1. improved learning as evidenced by higher level thinking, understanding more complex concepts, and improved level of understanding
2. improved social skills as a result of the cooperative learning activities and the emphasis on such things as quiet voices, eye contact, and disagreeing in an agreeable way.
3. the active involvement of more students in the learning process.

One disappointment was that no evidence was found that any regularly scheduled team meetings were held after the first semester of the school year following participation in the summer Academy. One principal indicated that the central office imposed four new initiatives in their building about mid-year and they were overwhelmed. Another principal, when asked if the teachers met on a regular basis, said, "No they don't, and that is my responsibility. I plan to encourage them to meet in the future." However, when asked about principal support for implementation of the new instructional methods, the teachers indicated that their principals were supportive in that they:

- attended the Academy
- purchased necessary supplies
- made positive comments about new methods being used
- encouraged to present to other teachers.

The findings indicate that there was minimal adoption of the innovative practices by other teachers in the building. Where that did take place it was largely due to the efforts of the principal in encouraging and scheduling opportunities for participants to demonstrate teaching strategies to the other teachers at faculty meetings. One principal developed teams with Academy participants as leaders.

One key suggestion for improvement was to have teams attending the Academy develop a pre-plan, while at the summer Academy, to schedule meetings and use methods learned. Another was that teachers return to their schools and become routine users of the innovation before being asked to demonstrate it to other faculty members.

CONCLUSIONS

As a result of attending the Southeast Teacher Academy, a substantial number of teachers impemented new teaching strategies. However, the goal of creating a more collaborative culture and a professional learning community was not met to any great extent. We were not able to affect the social side of change within districts. Future efforts of the Academy must concentrate on creating a culture that not only improves teacher skills, but also structures schools in such a way that the teachers have both the time to learn with and from one another, and the administrative support for continuous professional growth.

That said, since this research was completed, we have continued to have teams of teachers attend summer institutes with their principals over the last two years. We continue to have follow-up sessions during the year where teachers share examples of their work and their student's work. A Web page has been created to share sample Concept Attainment data sets. Some of these data sets come from teachers involved in similar projects in Canada and Australia. It appears that more and more teachers are getting involved. So something is continuing to happen. This tells us that organizations (and perhaps individual consultants) that are outside the zone of district influence can appear to make a difference. It also tells us that these organizations will find it very difficult to bring about change over time unless they consciously attend to the current wisdom on educational change. And this implies a commitment on the part of the districts to work at supporting the change efforts of their teachers during the academic year. If we don't, then we are at best perpetuating mediocrity.

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Jerry Waddle was a science teacher, high school principal, and superintendent of schools in Missouri before moving to higher education in 1997. He served as director of the Southeast Regional Professional Development Center at Southeast Missouri State University from 1997–2000 and became a member of the faculty in 2000.

Going Beyond the Basics:

A district's commitment to extend instructional intelligence

For the past few years, educators in Ontario and other Canadian jurisdictions have experienced unprecedented change in curriculum implementation, accountability testing, and funding formula. In response to these changes there has been an equally unprecedented emphasis on "what kids are expected to learn" and "how well they are learning it." However unintentional, the impact of the scope and complexity of recent educational change has been the emergence of a minimalist approach to teaching and learning that puts undue emphasis on "what" children are learning, often at the expense of "how" our children are learning.

This article provides an overview of the perspectives of system leaders, school administrators and classroom teachers as they reflect upon The York Region District School Board's early efforts to go beyond the basics by investing in increasing instructional intelligence. Above all, this article explores the process that a large school district has initiated in an effort to extend the capacity of classroom teachers to address those complex challenges found in the elementary and secondary school classroom.

Barry McKillop, a senior Curriculum Coordinator with the York Region District School Board, edited this piece for Orbit Magazine.

DIRECTOR OF EDUCATION

A New Direction for York Region: Meeting Diverse Needs

In YRDSB a clear focus on quality directs our work, and we take pride in the results teachers and students achieve. While academic excellence remains our primary focus, as one of Canada's fastest growing school districts we must also address issues related to our tremendous population growth and cultural diversity. At the same time, we face the daily challenge of maximizing the impact of our limited resources to support complex student needs.

Curriculum development is results-oriented and is designed, developed, delivered and evaluated to support students in their learning. Supporting teachers in the work of supporting students is an essential component of our culture. We have engaged in the systematic, strategic delivery of professional development in the areas of curriculum implementation as well as fostering a culture of assessment for learning.

So, where does Instructional Intelligence fit into this complex mosaic? System initiatives may support the teaching process, but the critical work of teachers takes place in the classroom. Instructional intelligence is based on the understanding that to assist students in their learning, teachers must make conscious use of the most effective instructional methods for the intended purpose. The interaction of teachers and students is where system support will result in improved achievement. Thus, the need to extend our Instructional Intelligence to all classroom practitioners is essential.

—Bill Hogarth
Director

MOVING FROM THE SCIENCE OF TEACHING TO THE ART OF TEACHING

The idea of intelligence implies creativity—making effective decisions through innovative combinations of ideas based on knowing the learner through "multiple lenses") . Other keying redients:

- One's personality and interpersonal intelligence; Coleman (1998) calls this self awareness and awareness of others
- An ever-deepening understanding of subject matter knowledge
- A wisdom about the use of assessment data and how to act on what those data tell us
- Understanding the process of change;
- Understanding how one learns over time;
- Carrying out professional work in an environment that supports intelligent and creative teaching

It's a buzz that will be getting louder and even more exciting as the project continues and as elementary teachers explore the balance of teaching as both an art and a science.

CURRICULUM COORDINATOR

Extending Instructional Intelligence in York Region Schools: An Implementation Process

In their book *Beyond Monet: The Artful Science of Instructional Integration*, Bennett & Rolheiser (2001) state: "... if you observe effective teachers over time, you will see they are highly creative, weaving a variety of concepts and processes into a deep understanding of what is being learned." In essence, this is the vision for the work being carried out in York Region schools. When determining the process that best supports the implementation of this vision, we have been guided by Michael Fullan's use of the term "integratable" when describing initiatives that are most likely to achieve measurable impact on a system-wide level. Board-wide initiatives in Assessment and Evaluation and in Literacy are seen to complement each other. Instructional Intelligence is not a disconnected new thing to do, but is the tool to use to improve instruction based on solid assessments.

Successful implementation comes about when teachers work in professional learning communities, or teams. Rosenholtz, as quoted in Fullan (2001, p.126), says that "... improvement in teaching is a collective enterprise ...." In York Region, school teams of an administrator and four teachers attend regional training activities. This core group is large enough to sustain continued learning at the school despite administrative or teacher transfers, or changes in schedules. The school team tries out strategies and tactics in new situations and asks encouraging questions of each other. The administrator/team leader builds "school-wide professional communities" by ensuring that teachers work collaboratively (Fullan, 2001). The effective leader ensures "program coherence" (Fullan, 2001) by demonstrating how developing the skills and strategies of instructional intelligence contributes to more effective student learning.

To date, 50 York Region school teams have worked with Barrie Bennett in multi-day Institutes held in August and December 2001. During these institutes, Dr. Bennett skillfully modeled effective use of an extensive set of skills, tactics and strategies to teach participants the foundations of Instructional Intelligence.

The school teams received on-going support through the year in four after-school Leadership Team Meetings. Here, Dr. Bennett reinforces key concepts related to Instructional Intelligence. School team members shared experiences and resourced with same-grade teachers from other schools. In addition to Leadership Team Meetings, school teams connect through e-mail and a York Region Instructional Intelligence Web site.

This August, "Instructional Intelligence Summer Institute, 2002" brings together more school teams from across the region to hone instructional and assessment skills. Over 300 teachers who have been working to implement strategies in their classrooms will then be able to work in teams to consolidate their skills and teach others ... an ambitious but exciting vision!

— Kyn Barker
Curriculum
Coordinator

SPECIAL EDUCATION RESOURCE TEACHER

Extending Instructional Intelligence: A Classroom Teacher's Perspective

York Region elementary school teachers are consolidating sound, effective teaching practices through the Instructional Intelligence project. Both new and experienced educators are feeling confident about teaching/learning strategies that continue to provide young learners with opportunities for growth and success in meeting the expectations of today's curriculum.

Through this work being carried out in partnership with OISE/UT and the accompanying book, *Beyond Monet: The Artful Science of Instructional integration* (Bennett & Rolheiser, 2001), elementary and secondary teachers are becoming master educators by making effective use of a broad variety of instructional processes.

Cooperative learning, concept attainment, mind mapping and concept mapping are just a few of the tactics that teachers are using daily in order to enrich the level of thinking and increase the motivation of students.

My first concept attainment lesson was invigorating for both the students in my Grade 5 special education withdrawal program and myself. On day one of the lesson, students helped to create the lesson "data set" by cutting animal photographs out of *National Geographic* magazines. The next day, the photos were sorted and mounted on a classroom bulletin board and the task analysis began. Following a lengthy and sometimes heated discussion, students began to deduce that all of the "YES" examples had fur and fed their young with mother's milk. They categorized these examples as mammals but were unsure about characteristics of warm-blooded and cold-blooded types. We discovered that this distinction could not be determined using the magazine photos.

Day three of the lesson took the group one step further into the investigation. A trip to the community pet store was quickly organized and there, students actually held a variety of animals as "YES" and "NO" examples for our data set. As the ferret nuzzled into their necks and the iguana sat stiffly on the palm of their hands, it became obvious to the children that these were important characteristics to discover in understanding the concept of mammals.

The excitement for the educator and the learner is contagious as new strategies are explored and old well-used approaches are dusted off and brought to life again through integration and interaction. There is a buzz in the air! It's about elementary teachers reflecting, networking and researching about the ways their students are learning and which instructional strategies they will be drawing upon to support tomorrow's program.

It's a buzz that will be getting louder and even more exciting as the project continues and as elementary teachers explore the balance of teaching as both an art and a science.

— Joanne Myers
Armitage Village
Public School

ELEMENTARY SCHOOL PRINCIPAL

An Elementary School Learning Team Explores Instructional Intelligence

The opportunity to participate in the Instructional Intelligence project came along at the perfect time. In the first year of a three-year school improvement plan, the goal was to have 75 percent of all students achieving at Level Three or above [the Provincial Standard], in Reading. The focus for this first year was to:

- assess students using curriculum assessment packages developed by the school's Assessment Learning Team;
- ensure that all students were working with copies of approved texts and appropriate resources; and
- develop programs and strategies that reflect the information gathered from the curriculum assessment packages.

Work to improve assessment literacy had been extensive in the previous two years. Staff members were ready to take the assessment data, analyze it and focus on successful strategies to move students toward, or beyond Level Three achievement. The next step was to look at specific instructional strategies to determine how these approaches could be used in classes to achieve our reading goal.

In August 2001, a school learning team of five teacher-volunteers joined the Vice-Principal and Principal at York Region's first Instructional Intelligence Summer Institute. For four days the school learning team were guided through a variety of instructional strategies by Barrie Bennett. Our teachers, who represented all divisions and the library and special education classes, came away excited and inspired, anxious to begin using some of the strategies in their classrooms.

During follow-up planning, the team decided that the 2001/2002 school year would be spent learning more about the strategies, using them in classrooms and working as a learning team before extending the work with Instructional Intelligence to the entire staff at H.G. Bernard Public School. Beginning in September, the Vice Principal and myself began to model the strategies at each staff meeting. Later in the fall, Dr. Bennett spent a day in the school conducting demonstration lessons in three different classrooms to illustrate effective use of specific instructional strategies. At this time, more of the staff began to participate in the project. The teachers immediately saw the connections among assessment literacy, instructional intelligence and our school priorities and goals, as well as recognizing the benefits to our students at all levels.

The success of the project, thus far, has been due to:

- a small group of teachers who have become instructional experts and who now enthusiastically share new approaches with other staff;
- the participation of Vice-Principal and Principal in the learning team activity; and
- the direct link to the School Plan for Continuous Improvement which has provided a clear focus for professional development at our school.

The original team at H.G. Bernard is excited to begin plans for year three, 2002–03, when the rest of the staff will take part in this very exciting learning experience.

— Kim Smith
H.G. Bernard
Public School

SECONDARY SCHOOL PRINCIPAL

Instructional Intelligence from a Secondary Principal's Viewpoint

YRDSB's School Administrator Leadership and Growth Profile outlines six key leadership dimensions:

- Community Leadership
- Strategic Leadership
- Operational Leadership
- Professionalism
- Interpersonal Leadership
- Instructional Leadership

Principals are strategically placed to shape the direction of schools, and to influence the achievement of students. I believe that continuous professional learning is critical to successfully implementing Secondary School Reform. New notions and concepts, debated and reflected upon, lead to continuous growth, both personally and with colleagues.

Ontario secondary principals and their staff have been implementing new curriculum for three years. Results-based curriculum was not a great departure from our outcome-based curriculum of former years. Grade-specific and subject-specific learning teams have constructed short- and long-range plans from the new curriculum documents and course profiles. At the same time, the district grappled with changes in assessment and evaluation practices. The Assessment Training Program Leadership Team, a district level learning team, developed and produced the Guidelines For Assessment and Evaluation document. Team members took advantage of professional learning through in-service opportunities.

The learning team model continues with the focus on Instructional Intelligence. Active participation, time-on-task, and assessment for learning all contribute to improved student learning. If a school team becomes increasingly refined in their understanding of instruction, and works together to deliver professional development opportunities to the rest of the staff, it inspires and energizes all staff to become high performers. Communication skills are enhanced, trust and empathy are promoted, coaching and mentoring opportunities are expanded, and collaborative decision-making becomes the norm. Principals, as instructional leaders, can build a school culture and, indeed, a district culture which promotes high expectations for all, collabo- rative norms, and continuous improvement.

— Reet Patterson
Sir William Mulock
Secondary School

COORDINATOR OF RESEARCH AND EVALUATION SERVICES

Making a Difference: Gathering Research Data on System Change

Three questions provided the initial framework for discussion of the Instructional Intelligence initiative. Two focused on how a school district can work to ensure successful implementation of change initiatives by attending to the current research literature on learning organizations, systems thinking and how to sustain organizational changes over time. The third focused on how a school district, over time, can align a number of processes, such as curriculum knowledge, assessment, instruction, knowledge of the learner, that are critical to student success.

These questions have been refined and made more specific to guide the development of a multi-year research plan. This plan will examine organizational change, classroom implementation and impact on student learning, through the exploration of the following research questions:

1. What organizational structures, supports and implementation processes are necessary at the school and system levels to lead to sustained change in instructional practices? What is the role of school administrators in supporting the implementation of change?

2. To what extent have teachers' and administrators' implementation concerns and ongoing needs for support been addressed? How is this accomplished at a school and system level?
3. To what extent have teachers developed skills in using a broad range of instructional strategies?
4. To what extent are teachers applying these strategies in their classrooms?
5. How does increasing teachers' skillful use of a broad variety of instructional strategies improve student learning and achievement, as well as such non-academic outcomes as engagement, time-on-task, behaviour and attitudes to learning?

The scope of this research is ambitious and requires ongoing collaboration between York Region staff and OISE/UT partners. Planning of the research component of this initiative is also supported by the Instructional Intelligence Advisory Committee which includes representatives from OISE/UT.YRDSB representation includes principals, teachers, Curriculum and Instructional Services and Research staff, the Chair of the Board of Trustees, the Superintendent of Curriculum and Instructional Services, both teachers' unions and the Ministry of Education. The research plan will continue to be refined throughout this school year.

Institute participants were surveyed on their familiarity with the strategies discussed and how often these strategies were tried in classrooms. School teams provided sample lessons developed using these strategies. These, along with samples to be collected throughout the project, will provide an important means of documenting the change process in York Region schools.

— Sandra Sangster
Coordinator of
Research and
Evaluation

SUPERINTENDENT OF CURRICULUM AND INSTRUCTIONAL SERVICES

Lessons learned ... thus far!

After only two years of our joint five-year project, lessons are already emerging for us: the importance of Central-Local Interaction, Evolutionary Planning, and Listening to the Practitioners.

1. Central-Local Interaction

Top-down/bottom-up implementation seems to be working. Instructional Intelligence seeds planted by senior staff, well before the project began, sparked interest with administrators and teachers. If we are in direct and constant dialogue with practitioners, we possess special knowledge that is critical to the informed decision-making that this initiative continues to require. Hargreaves (1994) concurred when he stated that strengthening both top-down and bottom-up forms of communication which allow for the redesigning of structures and cultures of schooling must occur so that teachers can be informed and continue to make changes in practice more easily and extensively.

As discussions with OISE/UT staff, our Director of Education and Curriculum Superintendent continued, we could see where this initiative might fit into our larger Curriculum Plan and meet the needs of some teachers. My initial thoughts were to start with one area of schools in our District. Director, Bill Hogarth, saw a need to develop a plan in order to embrace all schools as quickly as possible. Michael Fullan's (2001) advice came to mind, "think big, and start small." Teachers (bottom-up initiative) in many areas of our board soon owned this top-down idea! By starting with awareness sessions in one area, word traveled quickly and the idea caught fire in other areas as administrators and teachers requested to be part of the professional development sessions.

Perhaps superintendents and principals (top-down management), who really understand and internalize what a learning organization should look like, can foster capacity building (a bottom-up strategy) in what Fullan (1994) calls a coordinated, decentralized way. Wideen (1994) provides an example of this from his case study of Lakeview School:

> *"A small cadre of teachers, encouraged by the Principal's attitude and the flexibility of the Superintendent, undertook strong leadership roles and ownership of their successful school reforms. As their enthusiasm gathered momentum and grew in force, their desire to share affected the entire school. Their school became a whirlwind of ideas which was felt even beyond the school as the staff moved on and made significant impact at District and other community levels."*

2. Evolutionary Planning

Plans for changing classroom practice must be accompanied by thoughts of professional development. Over the last ten years, research regarding the creation of effective schools has identified that peer interaction and collegiality have been important factors in changing tacit cultural practices and developing strategic leaders. Evolutionary planning must include going beyond collaboration to providing support for risk-taking and experimentation at all organizational levels.

Wideen (1994) states that teachers need to develop the courage and trust to talk about the difficult dilemmas in classroom practice and to dig beneath surface congeniality to look at similarities and differences in teaching and learning beliefs and values. The implications for us are obvious: intensive planning is not static and status quo, but adaptable, flexible, and evolutionary.

Money and time must be found during the planned implementation as new needs are identified. For example, some of our project teachers and administrators felt that Tribes Training, complementary to our initiative, would be important. We found the trainer (one of our own secondary teachers) and held the event, only to discover a shortfall in the budget. We found the money needed in contingency funds, because teachers and administrators knew what professional development they needed to access, and were willing to commit personal time to do it. No amount of pre-planning could have anticipated that specific, immediate need. Contingencies are critical to "planned" change.

3. Listening to the Practitioners

It seems as if our implementation is getting ahead of us! Purposeful and careful listening to those in the field must continue to direct our process, where possible. Engaging and sustaining administrators' and teachers' excitement makes the difference. Running to catch up with that "learning together" culture is the ultimate goal of a Superintendent of Curriculum and Instructional Services! The boisterous dialogue in a 4–8 p.m. follow-up session, with 150 administrators, consultants and teachers in attendance, after a long day of teaching, is music to my disbelieving ears!

What are we doing right … so far? We're listening to teachers and the wisdom of what we know about classroom and school improvement. We work at weaving instructional methods that focus on outcomes and assessment and we allow teams to share their successes. Effective instruction is the heart of the matter, the wisdom of change! It is what students deserve and, we believe, unlocks the key to increased student achievement. Only time will really tell.

Our challenge continues to be statistically measuring the impact … but, if we listen to the practitioners, they are telling us that it is making a difference already to our kids in York Region.

In closing, Ken Leithwood (Orbit, 2001) reminds us that "…for educational improvement to occur, it is important to address not only people's motivations, but also their capacities and conditions of work … this theory suggests that people's motivations actually increase as they have the opportunities to get better at what they do …"

— Lyn Sharratt
Superintendent
of Curriculum
and Instructional
Services

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REFLECTIONS

"… I have had many engrossing conversations with educators at all levels revolving around our Board initiative. This is truly a piece that teachers are ready for and are desperately seeking out. You could not have timed it better! Teachers are ready for an approach to teaching that will better enable them to implement the curriculum more effectively. My journey with instructional intelligence started when a colleague and I began to explore instructional integration as a possible foundation for an additional qualification course in Intermediate Mathematics at OISE/UT. We were quickly convinced that this approach to teaching was essential if we were to fill a void that appeared to exist in our educational system. We were both excited about the future potential of Instructional Intelligence, not only because of its affect on our own practice as educators, but also because of the positive changes that it would create at all levels of the educational system. Instructional Intelligence is the key!"

— Sandra Fraser, teacher
Reesor Park Public School

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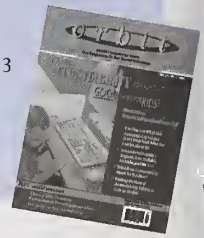

Oatlands School:

A journey of self improvement

The Oatlands Staff

The Oatlands School caters to students from kindergarten to Grade 12 and is approximately equidistant between Launceston, a major northern city, and Hobart, Tasmania's capital city in the south. Our school has about 430 students. Approximately 25 percent of all student enrolments originate from the immediate Oatlands area. The remaining are bussed in from outlying communities. Some students leave home at 7:30 a.m. and do not return until 4:30 p.m. During winter the long travelling time is telling on the younger students.

We are in the heart of Tasmania's Midlands; a farming area where some of the best wool in the world is produced. Tasmanian farming has seen a classic cost/price squeeze and a series of drought years. This once intensively settled agricultural area has seen much of its traditional population leave in search of employment. This gap has been taken up by families seeking cheap rent and these are often the long-term unemployed or itinerant suffering a high degree of social dislocation. The remaining agricultural workers are often casual labourers who run small farms and subsidize their income with off property employment. Our population is not a traditional rural one but an extremely low income one with over 80 percent of our student population not paying any school levies and with the attendant social problems of lack of access to many social resources.

This change in population presented a challenge that our school had never before had to face. Our traditional ways of working were simply not effective and the beginning of statewide testing revealed just how low our levels of student achievement were.

> *The most exhilarating thing is to look at what ten years of concentration on effective instruction, classroom management, and school restructuring have done for student outcomes.*

The most exhilarating thing is to look at what ten years of concentration on effective instruction (instructional intelligence), classroom management and school restructuring have done for student outcomes.

WHAT DO PEOPLE SAY ABOUT WORKING HERE?

An experienced teacher new to our school says, "It is so good to work with a group of students who are so cooperative. They try hard and are proud of the quality of their work. They look after each other and they respect the needs of others."

A teacher who has been here for some years says how much easier it is now to do any cooperative learning with older students. "When I first tried cooperative learning it was often a pretty big failure because the students just didn't know how to work with each other. Now it is easy because they have the social skills and the strategies and it is just a matter of giving the instructions. I didn't realize when I started that it needed long term systematic development of social skills to make it all work but now our students are just so capable."

A student in Grade 10 says, "There are things that I would rather not do but teachers explain why things are done the way they are. I like the kids in my group and I know that working with them has made me better at resolving problems and more assertive. I know I'm expected to have my say and to listen to others. I can see that the teachers work really hard to help us learn. I know a lot more now about the best ways for me to learn."

WHAT WAS THE JOURNEY?

Student alienation was showing itself in bullying, continual questioning of the curriculum, poor attendance, obvious underachieving, low retention to Year 11 and increasing problems with misbehaviour. When we took the time to stop and look, it became obvious that the way we worked was actually creating the alienation.

Study Group

We first looked at the Years 5 to 8 students. After two years of study we came up with a model of Middle Schooling that has gone on to receive national attention, with regular visits from schools all over Australia as well as our staff presenting at various forums throughout Australia. These are very valuable in giving us continued chances to reflect on our practice, to gather other ideas to feed into the program and as a way of celebrating our success. These all build a sense for our school, students, parents and teachers that we can celebrate our successes along the way. "Organizational ego" is what we talk about. Papers we have written are simply authored to Oatlands School and our message is that we are all involved in continual improvement and it is everyone's responsibility.

STUDENT LEARNING OUTCOME DATA
2001 STATEWIDE TESTING

	Appropriate of Higher	ENI	Statewide
LITERACY			
Grade 3	97.1%	94%	97%
Grade 5	92.4%	58.1%	68.1%
Grade 7	78.1%	64.1%	79.7%
NUMERACY			
Grade 3	94.4%	94.1%	97.1%
Grade 5	94.8%	70.3%	81.4%
Grade 7	93.9%	82%	91.5%

TASMANIAN CERTIFICATE OF EDUCATION YEAR 10 EXIT RESULTS

	Lowest Strand	Highest Strand
ENGLISH		
1992-95	30.5%	12.95%
2 year average	9.35%	28.2%
MATHEMATICS		
1992-95	43%	12.95%
2 year average	11.0%	44.6%

Note that each subject area has three strands of difficulty; a top strand being the most difficult.

SUSPENSION DATA

Past average – 40 students per year
2001 – 7
2002 – 2

RETENTION DATA

Year 10 students continuing to year 11
2001 – 45%
2002 – 90%

Keys to success:

Team teaching—Double units of about 50 students with two teachers plan and teach collaboratively. They are paired on the basis of complementary expertise in learning areas, male/female, new to the school/more experienced. The teaming of a male and female teacher is often the only time many of our students have seen a model of adult female/male interaction where both are equal in status.

Principal Teachers—This team is responsible for one group of students for 70% of their school time. This allows for the development of quality teacher/student relationships.

Collaborative planning time—Time is tabled to have all Middle School teachers off class at the same time for support, sharing, and to discuss issues particular to Principal Teachers.

Stable Tables—Students spend the majority of their time in teacher-designed default groups of four students at one table, leaving only for specific purposes and times. These groups are set for the year at the end of the previous year by all of the teachers. The groups have a balance of academic and social skills and the clear understanding is that issues will arise and support is there to help work them out.

Tutorial—Support teachers are timetabled each morning to allow the Principal Teachers to focus on smaller groups for remediation, extension, working in advance of a topic with students at risk to give them a head start, working on particular issues for some table groups, etc.

Negotiated Curriculum—Mathematics and language units are teacher planned and directed; the balance of the curriculum is arrived at by a process of collaborative negotiation that gives every student a voice in what questions are investigated and what learning activities are used to do this. The process works from tables up to whole class and the democratic ideals informing this are as important as the visible curriculum that is created by this process.

Whole School Approach—There was a marked improvement within the classrooms of the Middle School and for the staff who taught within this group but it had also worked to balkanize the staff. Without a whole school approach to the issues that galvanized action in the first place our Middle School was in danger of becoming a set model instead of a way of working that would allow us to deal with issues and continue to develop.

Care, Welfare & Behaviour Management—At whole school staff meetings and professional development days we hammered out responses to various likely misbehaviours and categorized behaviours into levels and worked out responses. We workshopped low-key responses (such as "the look" and "proximity," squaring off, effective choices, informal chats, how to deal with power struggles, etc.), as the basis of our system of responses. Groups designed the first two weeks of school to help create classroom climates to support student learning and create a sense of belonging. We designed lessons on social skills and started to incorporate social skills' objectives regularly into academic lessons.

Our CW&B Management included such things as having school-wide time out desks to be used as part of the system of choices. Students having difficulty managing their behaviour will, at the stage the teacher feels they are having a negative impact on the learning of their group, be given the choice to control the particular behaviour or work at the time out desk. Of course it is often an Implied Choice that moves them to the table as the teacher follows up on their choice but, once there, it is a school-wide rule that they need to work in isolation having lost the privilege to seek the help of their group. If they can do this they can then negotiate their way back into the class at a later time. If they are unable to settle here they know they are choosing to move on to a buddy classroom which is another classroom in the school; usually at a much different class level so as to remove the audience. They then return at an agreed time to negotiate their way back to class. Of course behaviours such as physical or verbal violence, refusal to do as they are asked or other level 5 behaviours (a school definition) means that they have chosen to have the issue dealt with by a Senior Staff Member. Choice and collegial support are at the basis of the whole system. While students didn't take part in designing this it is shared with them. The consistency this engendered has empowered the students to the stage where they now get righteously indignant if a relief teacher does not follow the system. They also know exactly what consequence to expect for any inappropriate behaviour and will usually tell you exactly what it is.

Pedagogy—The study of Brain Research showed us the implications for teaching and learning. We learned we would have to work smarter rather than harder. Whole school professional development days were devoted to research on instruction. During collaborative planning time we shared our successful lessons and asked for help in refining what we were doing. There was the chance to take risks, with support, and to get productive feedback. The challenge of lifting our student achievement levels was met with a much wider shared repertoire of instructional methods.

Whole Staff Professional Development—We brought in a consultant to work with our whole staff every year, for two days, usually at the beginning of the holidays so we could use some school time and some holiday time. We worked in our pairs and our sector groups. For most of our staff this was most of their professional development for the year as they would then work for the rest of the year in either formally organized groups within school or with their partner teacher to further refine their understanding.

WHAT WAS THE CURRICULUM?

Our meetings and professional development were all about instruction and classroom management but there were also statements about how we dealt with each other, how we resolved issues, and how we valued each other as professionals. Instructional intelligence was as much about classroom management and how we dealt with change as a staff as it was about developing a system of instruction. It all had to fold together.

The "No Blame Policy" was a strong statement of the trust we had for each other and it was one of our Principal Teacher's catch phrases. It simply meant that we do not look for blame if something goes wrong; just how it can be avoided in the future. Perhaps it's easier to see its effect in the negative: What is the consequence of finding someone to blame? Who wants to belong to an organization that apportions blame when no one really ever sets out to make a mistake or plans to have something go wrong?

We needed the language to be able to deal with any conflict. We learned about working towards a common conclusion rather than defending our own positions and moving further apart; listening while suspending judgement. We needed the same social skills as our students. A good staff room and a good classroom have more in common than we had realized: being met at the door and talked to; being listened to and having our opinions valued. Pivotal in all of this was our last Principal, Keith Wenn. He held a specific curriculum very clearly in his mind and was clear in sharing it with us .

We also realized that we could solve our own problems and were given the right and responsibility to do so. If someone was good at doing something the group needed, they were given the time and support to go ahead. Being a Senior Staff Member is not a right, authority is based on ability. There are no Senior Staff Meetings and everyone has input into decision making. Decision making is based on evidence, not emotion. Staff members are encouraged to find the research that supports a better way of doing things and bring it to the group for consensus. When this is reached then the change is instituted. If it's a good idea then everyone uses it. We don't work in isolated classrooms but in a school that expects we will work as a team, share good practice and support each other.

HOW DO WE SUSTAIN THE CHANGE PROCESS?

We take staff induction very seriously. The most powerful induction is through careful teaming. All new staff are introduced to our CW&B Management policy before the beginning of the school year. We have a way of working and staff are expected to work in this way: the Middle School system, the morning language blocks in the K–4 sector, collaborative planning, team teaching. Everyone has the right to put forward changes but they must be supported by evidence and brought to the whole group before changes are made to the way anyone works. We have an open agenda for every staff meeting on the board in the staff room for anyone to add to. We always have an "around the room" at every staff meeting. We continue to deliberately foster convergent discussion and a clear message that anyone who works here is a member of the team. All the things that make for a classroom where students belong are just as deliberately addressed for staff.

Interestingly, our school student population is growing. When you work at making a difference, and you do make a difference, people find out. We enjoy being at this school with the students and with each other.

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Socially Smart...

Instructionally Intelligent

Michael Fullan

Barrie Bennett and his colleagues have made a compelling argument that teachers must become much more instructionally intelligent if they are to serve all students. The craft of teaching is to figure out the myriad ways to respond to increasing diversity and complexity of learners. For that, they need a range of instructional conceptions and skills that is constantly being developed and honed. The intellectual, scientific and artistic side of teaching has been neglected. We need caring teachers, but if they are to be effective, they must have a depth of knowledge and intelligence commensurate with the complexity of the task.

In this brief article, I will make the case that you cannot become instructionally intelligent unless you are also socially smart. The argument is constructed in three interrelated ways with respect to Emotional Intelligence, Professional Learning Communities, and engaging students as learners.

Goleman (2002) has made the definitive case that emotionally intelligent people live longer and live better in complex times. You can barely survive let alone be effective if you do not develop emotional intelligence. Goleman and his colleagues have identified four core components of emotional intelligence. The first two pertain to personal competence; the second to social competence:

Personal competence:

1. Self-awareness (accurate self-assessment of one's strengths and limits)
2. Self-management (emotional self-control and adaptability)

> *The implications of this special issue of Orbit are perhaps more profound than most people realize.*

Social competence:

3. Social awareness (empathy, especially with others different than oneself)
4. Relationship management (change catalyst, conflict management, collaboration)

All four competencies concern being socially smart. Anyone in a highly interactive situation, especially one charged with emotion and conflict must have high degrees of emotional intelligence. One would be hard pressed to think of an occupation that is more interpersonally challenging—relentlessly so—than teaching. Becoming a highly effective teacher, then, requires skills beyond the cognitive and artistic into the realm of personal and social effectiveness.

It is not just students that teachers interact with, but also other teachers and a host of other adults inside and outside the school. This is best illustrated by reference to professional learning communities. As Newmann et al. (2000) found, schools that are especially effective even under (one could say particularly under) difficult circumstances have a certain "capacity" which they said consists of five elements:

1. individual skills and dispositions
2. professional learning communities
3. program coherence
4. technical resources
5. school leadership

As they stress, individual skills are not effective in an inhospitable environment. You must also have a strong collaborative culture in which people work and learn together focusing on student learning and on action plans to improve learning. To do this they must figure out together how to handle "multiple innovations" and achieve some degree of focus or coherence, and they must mobilize a good deal of resources (time, money, materials, access to expertise and so on). Finally, leadership, as many others have found, on the part of the principal and key teachers is essential for fostering the first four elements. This is to say that the role of leaders is to help "cause" people in the organization to become increasingly intellectually intelligent and socially smart.

Our work on knowledge development and sharing is another confirmatory aspect of professional learning communities (Fullan, 2002). Brown & Duguid (2000) made the brilliant observation that information only becomes knowledge through a social process. We have reams of data bases, but far fewer social mechanisms for transforming the information into deeper, shared insights. Professional learning communities are effective because they have norms and structures that purposely promote social interaction. In a recent book I argue that our recent successes in improving literacy and mathematics do not go deep enough into changing the culture of

The biggest problem in schools is how to engage disaffected learners, a percentage that increases with grade level.

learning (Fullan, in press). For the latter we need sustained interaction with increasing depth in solving learning problems. In short, information becomes knowledge through a social process, and knowledge becomes wisdom through sustained interaction. Note also that sustained interaction simultaneously and seamlessly fosters both instructional intelligence and social smartness. Stated another way, instructional intelligence develops best and is most effective when it is shared by the group.

This brings us back to the student, and to the observation that teachers must be incredibly socially smart to figure out how to engage diverse learners. The biggest problem in schools is how to engage disaffected learners, a percentage that increases with grade level, so in high school you can have very large percentages of disengaged learners. Certainly having a repertoire of instructional strategies is crucial, but it is not sufficient.

McLaughlin & Talbert's (2001) research on 16 high schools makes a related point. They found three patterns of teaching: enacting traditions of teaching, reducing expectations for students, or innovating to engage learners. They found that only 3 of the 16 schools had professional learning communities. Of most interest was their finding that some schools had strong teacher communities, but that teachers interacted (unwittingly) to reinforce each other's bad or ineffective practice. In other words, they interacted to reinforce traditions of teaching or aligning expectations with performance, rather than figuring out new ways to reach disengaged students. It should be obvious that the solution is none other than combining instructional intelligence and social effectiveness to develop, implement and continuously improve learning in which teachers develop shared commitment and knowledge.

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The implications of this special issue of Orbit are perhaps more profound than most people realize. We can all readily agree that teachers should become more instructionally sophisticated and interpersonally effective, but the bigger question is how could they become this good. This will require a major transformation of the teaching profession because currently the conditions for teachers developing prior to and on the job do not nearly approximate the intensive learning that would be required. Cohen & Hill (2002) for example studied mathematics reform in California, and found that only 1 in 10 teachers had the intensive "opportunity to learn" that brought them to the depth of learning in which they could work with students and the math curriculum to get results.

In *Change Forces With a Vengeance* I argued that even the most successful strategies achieve what I called "horizon one" results (for example, improvements in literacy and mathematics). Horizon two goes deeper into the engagement of all learners and their intellectual, personal and social growth. This will require massive cultural and organizational change in the teaching profession and the conditions under which it works.

In conclusion, instructional intelligence gets us beneath the surface and opens up a whole new world of reform which will require all the intellectual and social smartness we can muster..

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Michael Fullan, Dean of the Ontario Institute for Studies in Education of the University of Toronto, is recognized as an international authority on educational reform. He is engaged in training, consulting, and evaluation of change projects around the world. His books have been published in many languages. He is co-author of the *What's Worth Fighting For trilogy* (Teachers College Press), and author of the *Change Forces trilogy* (Routledge Falmer Press), *The New Meaning of Educational Change*, Third Edition (Teachers College Press), and *Leading in a Culture of Change* (Jossey-Bass).

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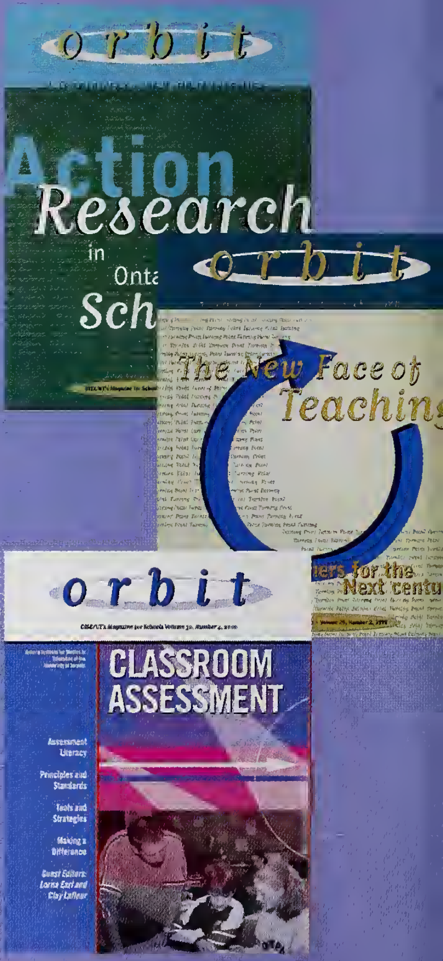

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